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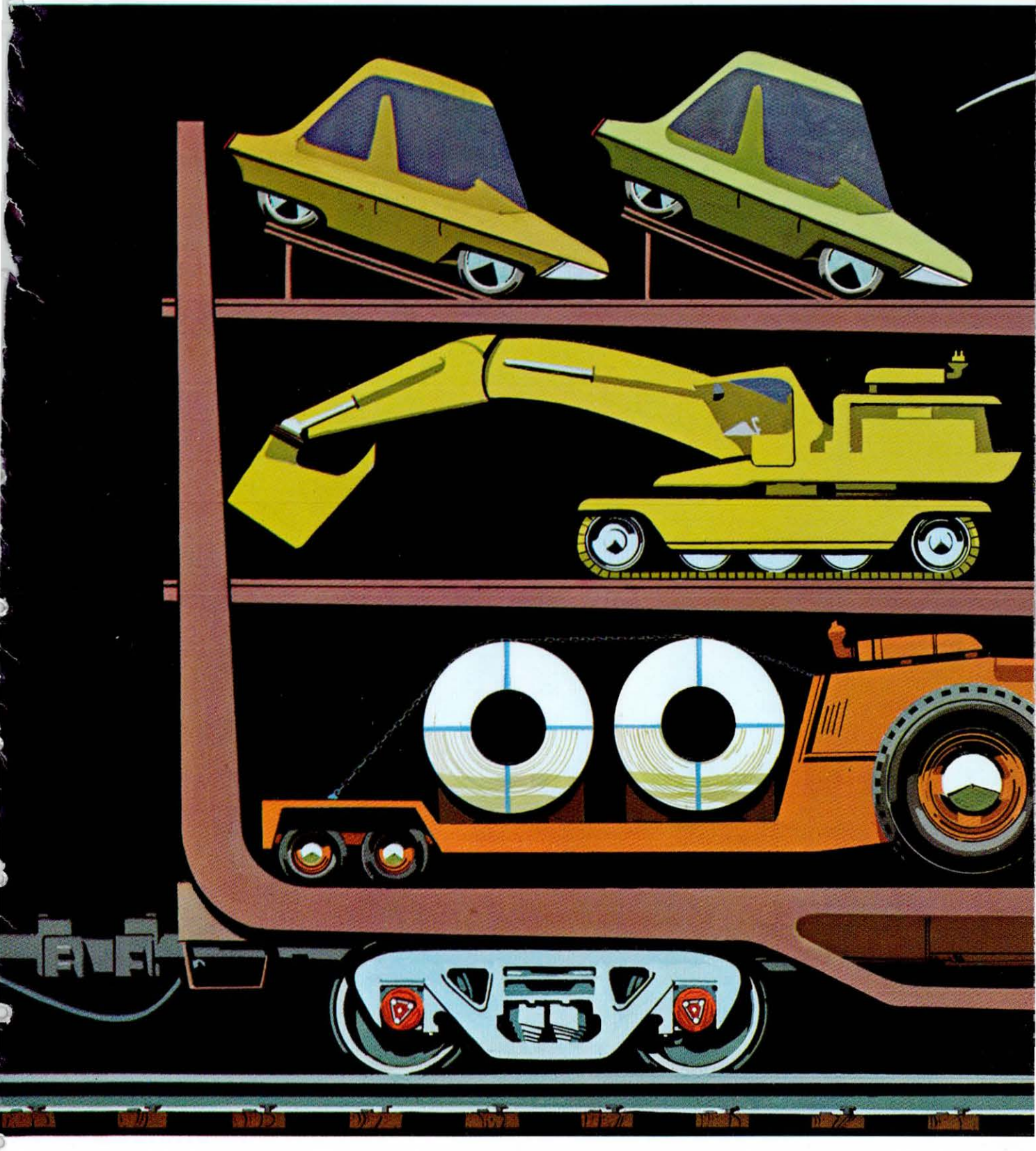

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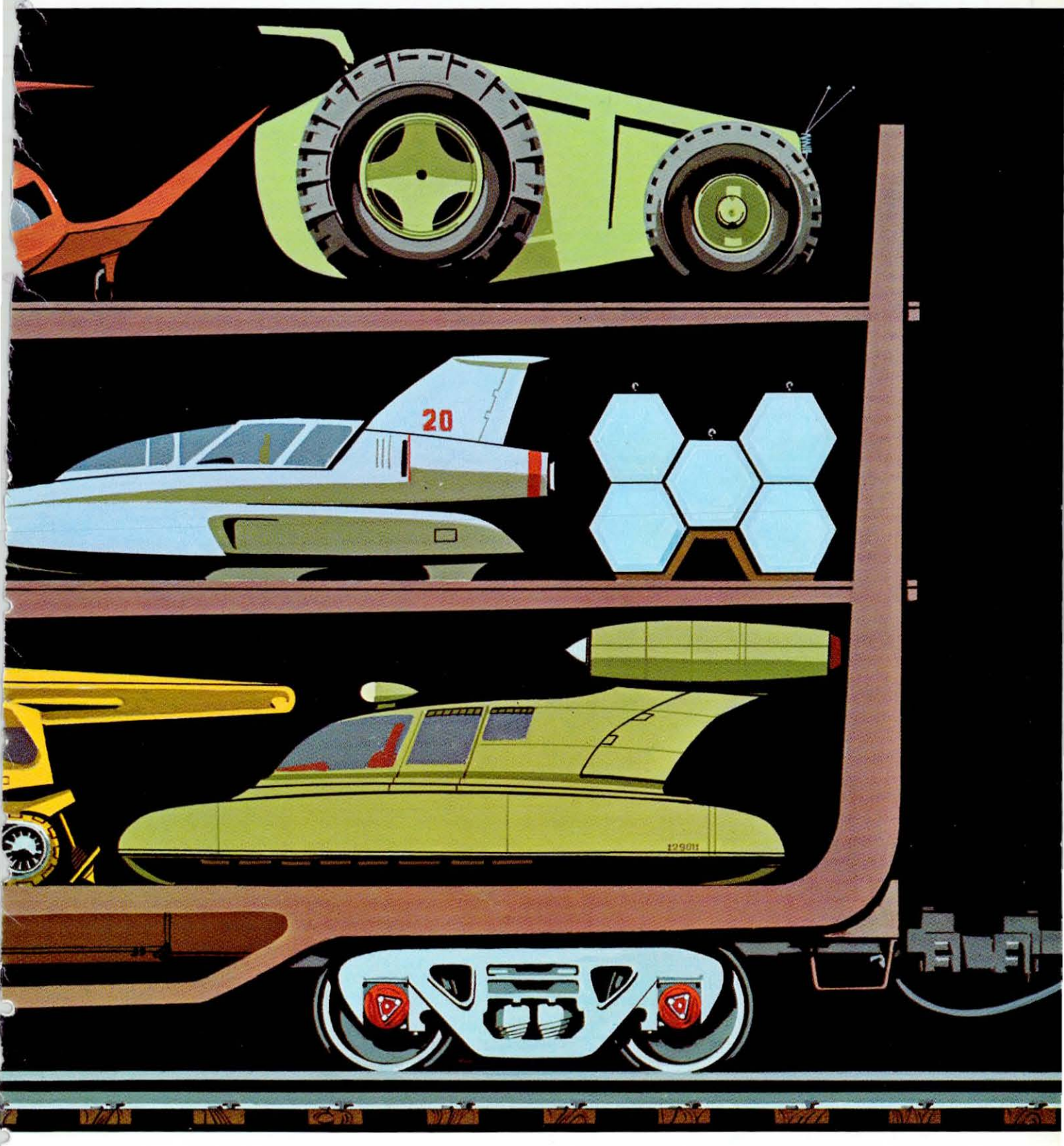
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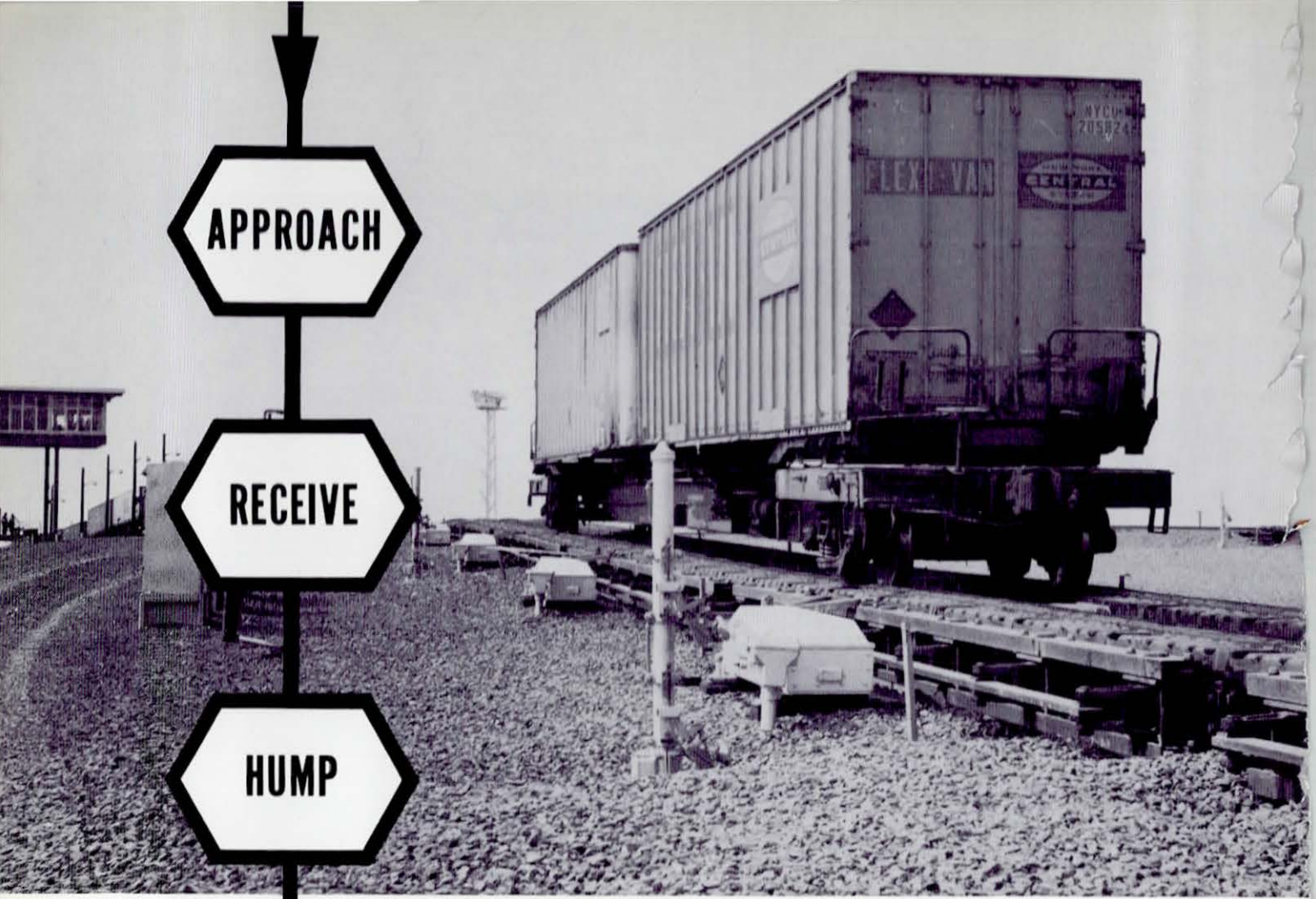

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RAILWAY AGE

March 17/24, 1969 • Vol. 166, No. 10

THIS WEEK

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. . . AND COMING NEXT WEEK

In an exclusive interview with Railway Age, AAR President Thomas M. Goodfellow describes a new research effort for the railroads. Also in the March 31 issue: A special report on loss-and-damage prevention. Like all Freight Traffic Issues, this one will go to 10,000 industrial traffic managers in addition to our regular subscription list.

Railway Age, established in 1856, is indexed by the Business Periodicals Index, the Engineering Index Service and the Public Affairs Information Service. Name registered in U.S. Patent Office and Trade Mark Office in Canada.
Published weekly (except for four issues combining two-in-one) by the Simmons-Boardman Publishing Corporation, 508 Birch St., Bristol, Conn. 06010.
Railroad employees' subscription rate, U.S. possessions, Canada and Mexico, $6 one year, $9 two years, all others $15 for one year, payable in advance and postage paid. To railroad employees elsewhere in the western hemisphere, $10 a year. Single copies 60¢ except special issues.
Address all subscriptions, change of address and correspondence concerning them to Subscription Dept., Railway Age, P.O. Box 961, Bristol, Conn. 06010.
Change of address should reach us three weeks in advance of next issue date. Send old address with new enclosing, if possible, your address label. Post Office will not forward copies unless you provide extra postage.

Circulation Dept.: John Rogers Director of Circulation, 30 Church St., New York, N.Y. 10007. POSTMASTER—SEND FORM 3579 TO P.O. Box 961, BRISTOL, CONN. 06010.
Printed at the Hughes Printing Co., 34 North Crystal St., East Stroudsburg, Pa. 18301. Second-class postage paid at Bristol, Conn., and at additional mailing offices.

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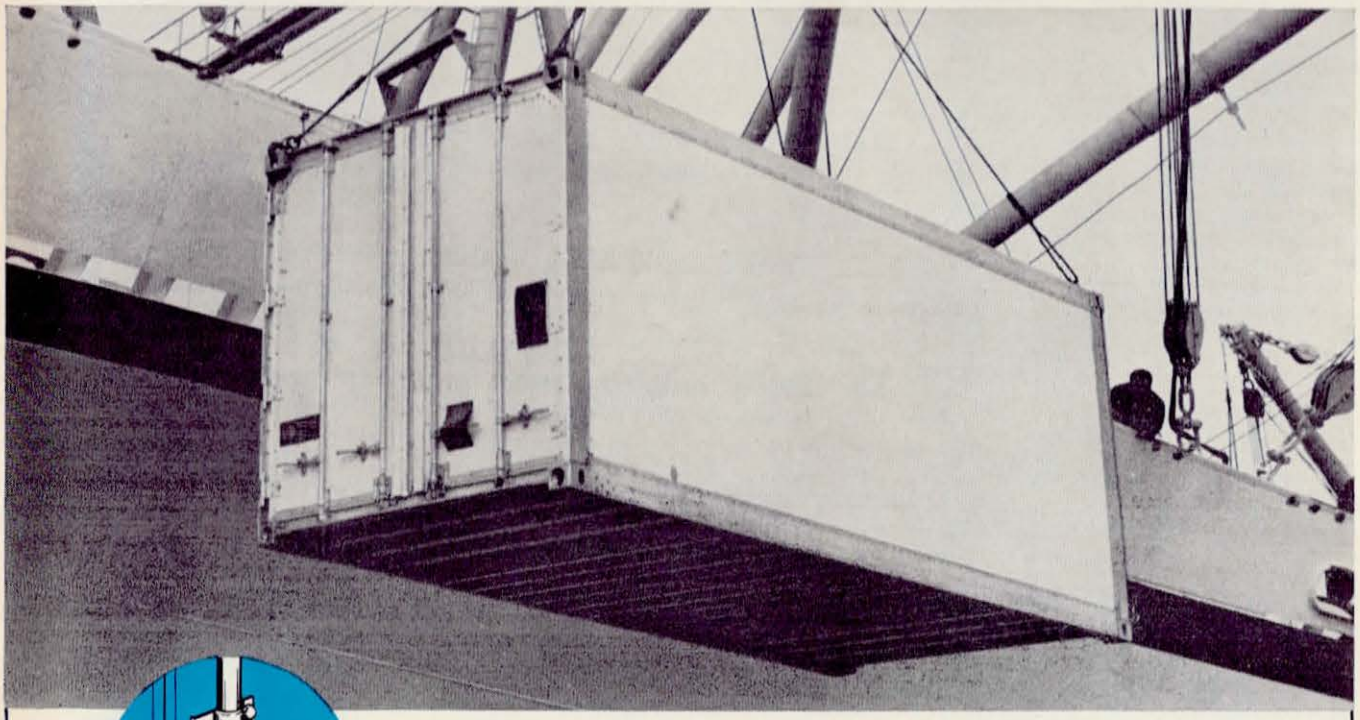

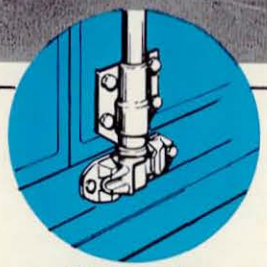

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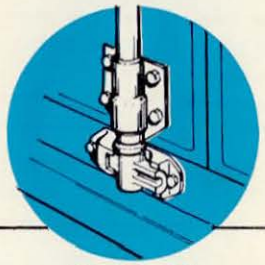

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Circle 3 on coupon page 50

SHORT AND SIGNIFICANT

Hartke takes surface transport chairmanship

As expected for the 91st Congress line-up of Democrats on the Senate Commerce Committee, Vance Hartke of Indiana is taking over the Committee's surface transportation subcommittee. Ahead of Hartke in seniority, Warren G. Magnuson of Washington, acting on his prerogative as full Committee chairman, is switching from consumer to aviation leadership, and John O. Pastore of Rhode Island is keeping communications. Next in line after Hartke, Philip A. Hart of Michigan will take a new subcommittee on energy, natural resources and environment. Howard W. Cannon of Nevada is passing up a subcommittee chairmanship to act as aviation vice chairman. Russell B. Long of Louisiana will take merchant marine and Frank E. Moss of Utah will take the consumer chairmanship.

GE subsidiary now leasing rolling stock

GECC Leasing Corp., a major lessor of such capital goods as jet transports, has now entered the rolling stock field. The first rolling-stock lease arranged by the leasing subsidiary of General Electric Credit Corp. involved the supply of 431 box cars to the Grand Trunk Western under two separate long-term agreements (see p. 53). The initial lease covered box cars purchased by GECC from ACF. The Trust Department, Manufacturers National Bank of Detroit, participated in this lease arrangement via private placement of certificates of GECC Leasing Corp. The second lease included cars built by Pullman - Standard and Thrall. Salomon Brothers & Hutzler arranged a private placement of "certificates of interest" in this lease. Bankers Trust Co., New York, is trustee and Morgan Guaranty Trust Co. of New York is agent.

Volpe rejects interest conflict in Boyd-IC case

On the basis of a preliminary investigation, Transportation Secretary John A. Volpe has cleared his predecessor, Alan S. Boyd, of alleged conflict-of-interest in a proposed $25-million grant to a Chicago suburban group for buying and leasing computer cars to Illinois Central, of which Boyd becomes president April 1. The first report "indicated no wrongdoing here at all," Volpe said. But that report was "sketchy," and "I have asked for a full-scale report detailing every step of the way what transpired," Volpe added. The final statement will come in about a week: "I would hope and believe possibly that there is absolutely no wrong here, but I want to be sure . . . " Boyd had no voice in the decision in the proposal by DOT's Urban Mass Transportation Administration, and did not indicate to anyone directly involved that he would be taking an IC position, Volpe said. Furthermore, IC had no direct dealing with DOT and it is possible that the South Suburban Mass Transit District had no knowledge that IC "might be engaging the Secretary of Transportation as their president," Volpe added. However, Volpe said he is also reviewing whether he will permit UMTA to make further grants "up to that kind of money" without his OK. Volpe discussed Boyd as part of a March 13 taping of a United Press International audio program, "From the People," which will be aired in segments.

Susquehanna withdraws bid to join PC

Irving Maidman, president and chairman of the 70-mile New York, Susquehanna & Western, says the line is withdrawing its application to the ICC for an order compelling the Penn Central to merge with NYS&W. A statement said Maidman reached the decision "after spending countless hours in 16 futile meetings with Penn Central officials, innumerable telephone conferences and $300,000 in legal and consulting fees." Maidman claims that the line is now showing a profit and declared: "The Susquehanna is not up for grabs as a sleeper or as salvage . . . . I believe NYS&W's assets and resources will be put to best use and its potential more fully realized under continuing independent management."

MONDAY MORNING REPORT

SECRETARY Volpe (right) with Bryce Wyman, General Electric vice president and general manager, Transportation Systems Division.

SECRETARY VOLPE LOOKS AT TRANSIT

As President Eisenhower's Federal Highway Administrator, John A. Volpe was a chief architect of the Federal Highway Act of 1956, When President Nixon appointed the nation's No. 1 concrete mixer to be Secretary of Transportation, there was, to put it mildly, consternation in non-highway ranks. The fears of rail and mass-transit men appear to have been unfounded. At the fourth International Conference on Urban Transportation in Pittsburgh, Volpe made his first major public address as DOT chief—and he made it clear that today he is anything but a highway man.

KEEPING THE AUTOMOBILE IN ITS PLACE

Volpe conceded that the automobile—"that grand old American institution"—has its place, but not, he insisted, at the expense of efficient mass transit. He even suggested, to the obvious discomfort of highwaymen in his audience, that we may one day have to tax automobiles entering cities. "More and more," he said, "the hallowed right to jump into our cars and drive them anywhere we please is being tallied against other community and individual values."

SOME DAY, PERHAPS, A TRANSPORTATION FUND

At a press conference following his speech, Volpe strongly supported a mass-transit trust fund, quite apart from the highway trust fund. And some day, he said, we might have a transportation trust fund.

BUT HOW ABOUT CONVENTIONAL RAIL?

Railroad men in Volpe's audience were not entirely pleased—because as he listed the options for tomorrow's mass transport, he mentioned "V/STOLs, steambuses, gravitrains, hydrofoils, or tracked aircushion vehicles"—but failed to include standard duo-rail. Said Volpe: "Responses of the past simply will not lead to the solutions we want in the future." It remains for railroad men to persuade the Secretary that some of the past—as Europe and the rest of the world have proved—is worth rediscovering.

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N&W-C&O merger gets green light from ICC examiner

Interstate Commerce Commission Examiner Edward L. Boisseree last week recommended merger of Chesapeake & Ohio into Norfolk & Western, for a new 27,000-mile railroad with estimated annual revenue of $1.9 billion. N & W must take direct control of Baltimore & Ohio and its subsidiaries, now controlled by C & O, and absorb B & O within one year after merger consummation, Boisseree said.

Also, N & W must take indirect control of Boston & Maine and Reading, through N & W's subsidiary, Dereco Company, (which already controls Erie-Lackawanna and Delaware & Hudson), if B & M and Reading agree. And N & W-C & O must agree with Central Railroad of New Jersey trustees for ultimate inclusion of C N J, and with Southern and Louisville & Nashville for coal movement from southern Appalachian mines.

WEEK AT A GLANCE

TurboTrains due by April 1

Transportation Secretary John A. Volpe said in Washington last week that "we can expect the start of TurboTrain service from the Boston end of the Northeast Corridor by the first of April." The TurboTrains, at least initially, will make the complete Boston-New York run, despite earlier reports that they would be terminated in New Haven in order to "feed" the Metroliners.

Whitman gives dangerous-cargo safety priority

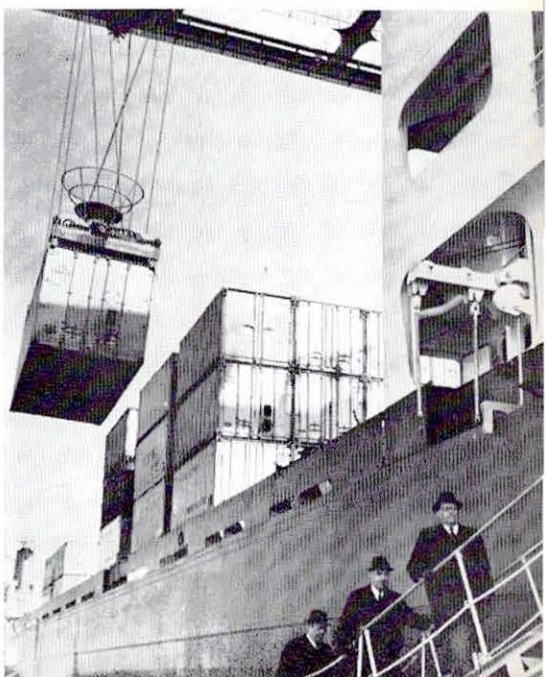
At a March 13 Senate Commerce Committee hearing on his nomination as Federal Railroad Administrator, Reginald N. Whitman pledged this priority: "I would think that our initial effort is going to have to be toward solving the handling of dangerous materials." Legislative changes aren't necessarily needed now for safety, Whitman added.

Whitman also told the Committee that FRA's function is to guide railroads "in achieving a safe and efficient service and also help them to maintain their ability in the long-term growth area."

In addition, Whitman offered support for studies of the rail role in intercity travel and for high-speed efforts like the Metroliner, which he said "shows a great deal of promise;" said he will cooperate with Interstate Commerce Commission efforts to soften the box car shortage.

Milwaukee Road takes a new look at Far East import/export traffic

It's up the gangplank and all hands on deck for top Milwaukee Road officers as they launch a three-week study tour of import/export traffic development in Japan, Hong Kong and Taiwan. Boarding the Haruna Maru in Tokyo to inspect container-handling facilities are (left to right) P. L. Cowling, assistant to the president, and vice president of Milwaukee Motor Transportation; George H. Kronberg, vice president-sales and service; and W. Edward Cartwright, manager-foreign freight sales. This is the third Far East swing in three years for Milwaukee. As in 1967 and '68, their people will visit major cities in Japan, calling on government officials and officers of industrial firms, steamship companies, port authorities and trading companies. Hong Kong and Taiwan are being added to the 1969 trip "because of recent development in industry and the possibility of container service being established there." Accompanying Cowling, Kronberg and Cartwright is George F. Flynn, Milwaukee's director of sales in Tokyo since March 1968.



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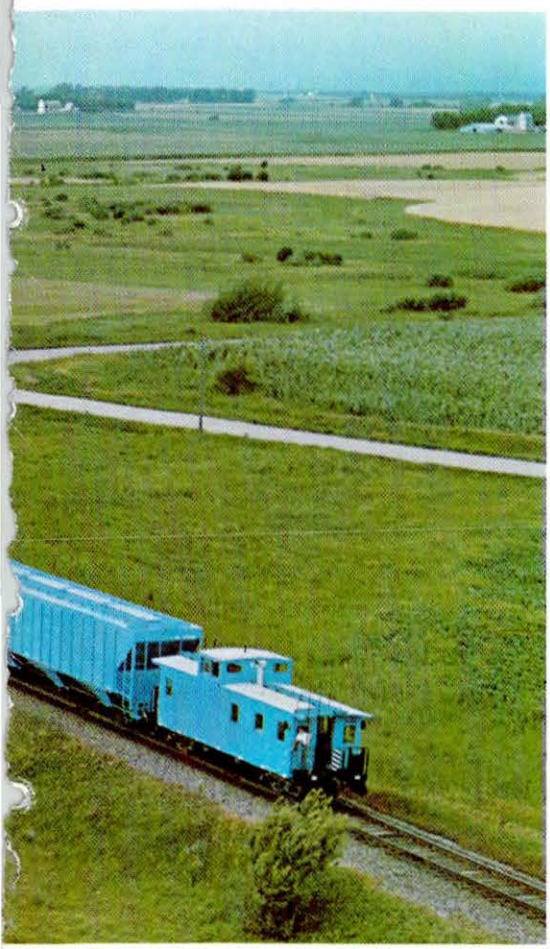

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LINES ON LABOR

WHEN A MAN'S FOOT SLIPS on the bottom rung of a ladder, instinctively he reaches for a higher rung to save himself. The Brotherhood of Railway and Airline Clerks is showing the same instincts. BRAC has lost jobs and members at the bottom of the ladder in railroading. It's reaching out for jobs and members at the top.

THE CLERKS HAVE SERVED Section 6 notices calling for revision of the scope rule. The union wants national handling, though scope has been, historically, a subject for local negotiation. The union wants jurisdication over employees covered by 36 separate ICC job divisions (except where such jobs are already covered by agreements with other unions).

MANAGEMENT PEOPLE, speaking honestly, have mixed emotions. They believe, or some of them do, that the Clerks have been rather liberal in past, local interpretations of the scope rule. They know that technology's advance has taken numbers from the organization. They know that tomorrow's technology, including ACI, will hit BRAC. They appreciate the union's problem. But they don't want it solved at the industry's expense, or at the excepted employee's.

WHAT THE INDIVIDUAL EMPLOYEE thinks may be something else again. Unfortunately, that may not matter. Management people point out, rather candidly, that management has historically tried to take care of the excepted employee, wherever possible, in somewhat better style than a union agreement would have required. Management people know, however, that recent union agreements—principally, those involving fringe benefits—have made it tougher for the industry to follow that "better style." In the job-security area, for instance, union clerks may enjoy a better deal than non-union clerical people. But, as one personnel officer points out, plaintively, the general-office employee inherently has greater security than the yard-office employee—and thus job-protection provisions of union contracts may involve "a distinction without a difference."

MEANING NO OFFENSE to good union members, there are certain other "security" matters involved in putting everybody from the professional-assistant level on down under a union agreement. There are serious questions which might be raised regarding the "benefits" which non-union personnel might gain by being brought under the BRAC blanket. And finally, there's even a moral question—since the people involved won't have a vote. Under the law, it would seem, they're objects to be seized.

BLE wage case settled; ORC&B, BRS still talking

Little by little, the National Railway Labor Conference and the brotherhoods are coming to the end of the line in the current round of wage cases. As matters stood last week, the Brotherhood of Locomotive Engineers had settled; the Order of Railway Conductors & Brakemen remained a holdout; and the Brotherhood of Railroad Signalmen issued a preliminary rejection of Emergency-Board wage recommendations as "not adequate."

In the BLE dispute, settlement came generally along the lines of Emergency Board 174's recommendation, with additional adjustments in road service and for engineers without a fireman.

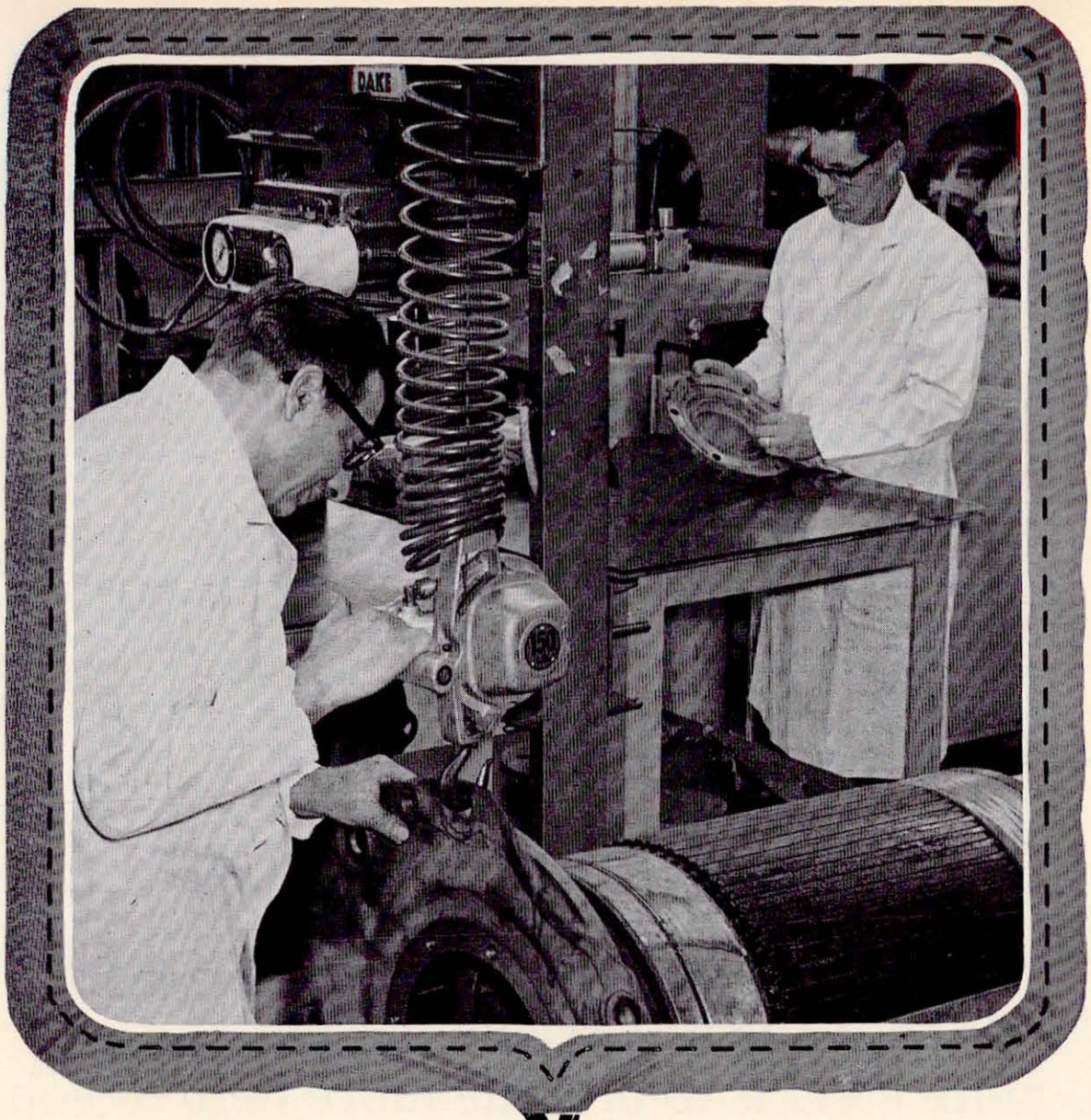
Board 174 issued similar recommendations covering the ORC&B case, and there were signs last week indicating that settlement probably could be reached without a work stoppage. The 30-day no-change period following the Board's report expired March 15 and ORC&B would have been free to strike—but the union preferred to keep talking, and gave assurances that it would take no "overt" action before March 22.

Meanwhile, BRS negotiators and NRLC set up a meeting for March 20, after the union's general chairmen met and agreed unanimously that Emergency Board 175 didn't propose satisfactory terms for settlement.

Inequity adjustments were key issues in all three of these wage cases, but particularly with the Signalmen who regarded themselves as greatly disadvantaged in terms of wage comparability with railroad electricians.

Board 175 recommended application of a pattern general wage increase—3.5% retroactive to July 1, 1968; 2% retroactive to Jan. 1, 1969, and 3% effective July 1, 1969. It also proposed a 20-cent-per-hour adjustment for skilled employees retroactive to July 1, 1968, and applied as if it had gone into effect in advance of the general wage increase effective on that date.

Board 175 noted that "it was in the skilled inequity area, not the general-wage-increase area, that the organization had a special problem which begged for a special response. We have so responded. Our recommendation on the skilled inequity adjustment covers approximately 80% of the employees represented by the organization." By the Board's estimate, the general increase plus adjustment will give most BRS employees a 14.5% wage boost.



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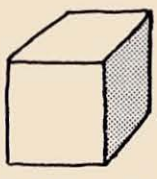

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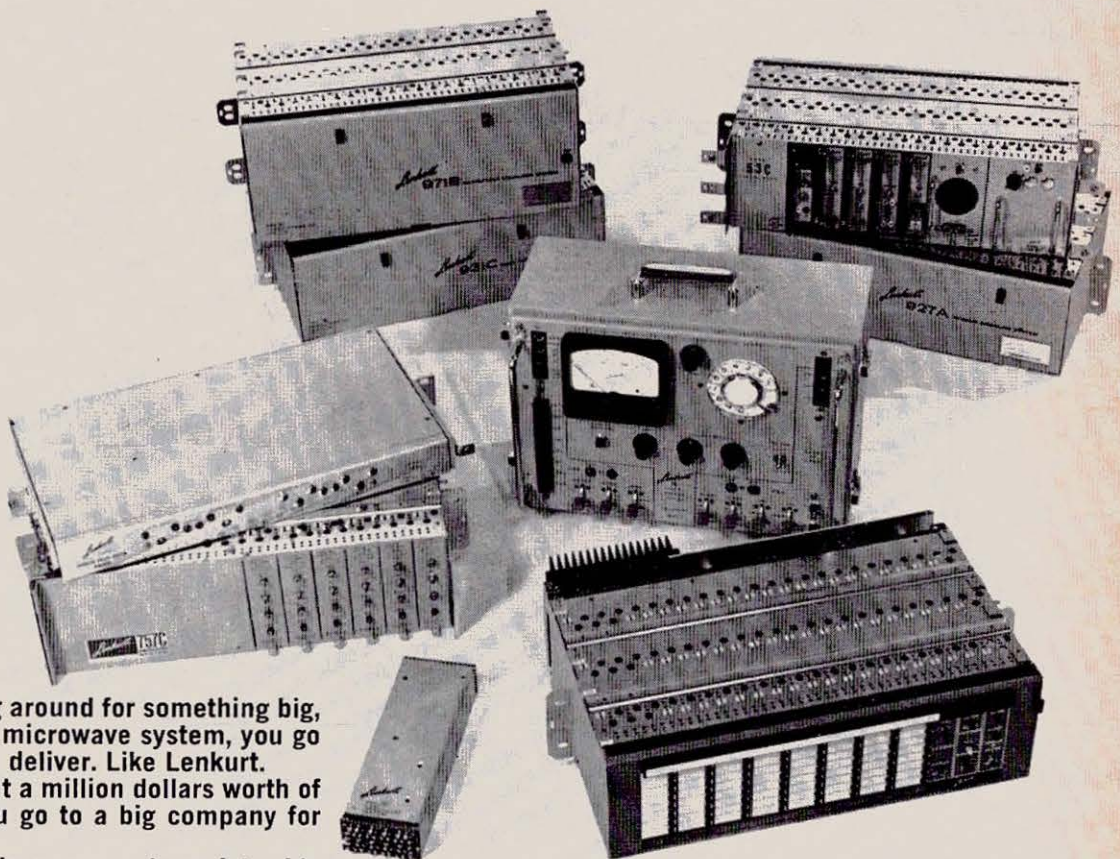

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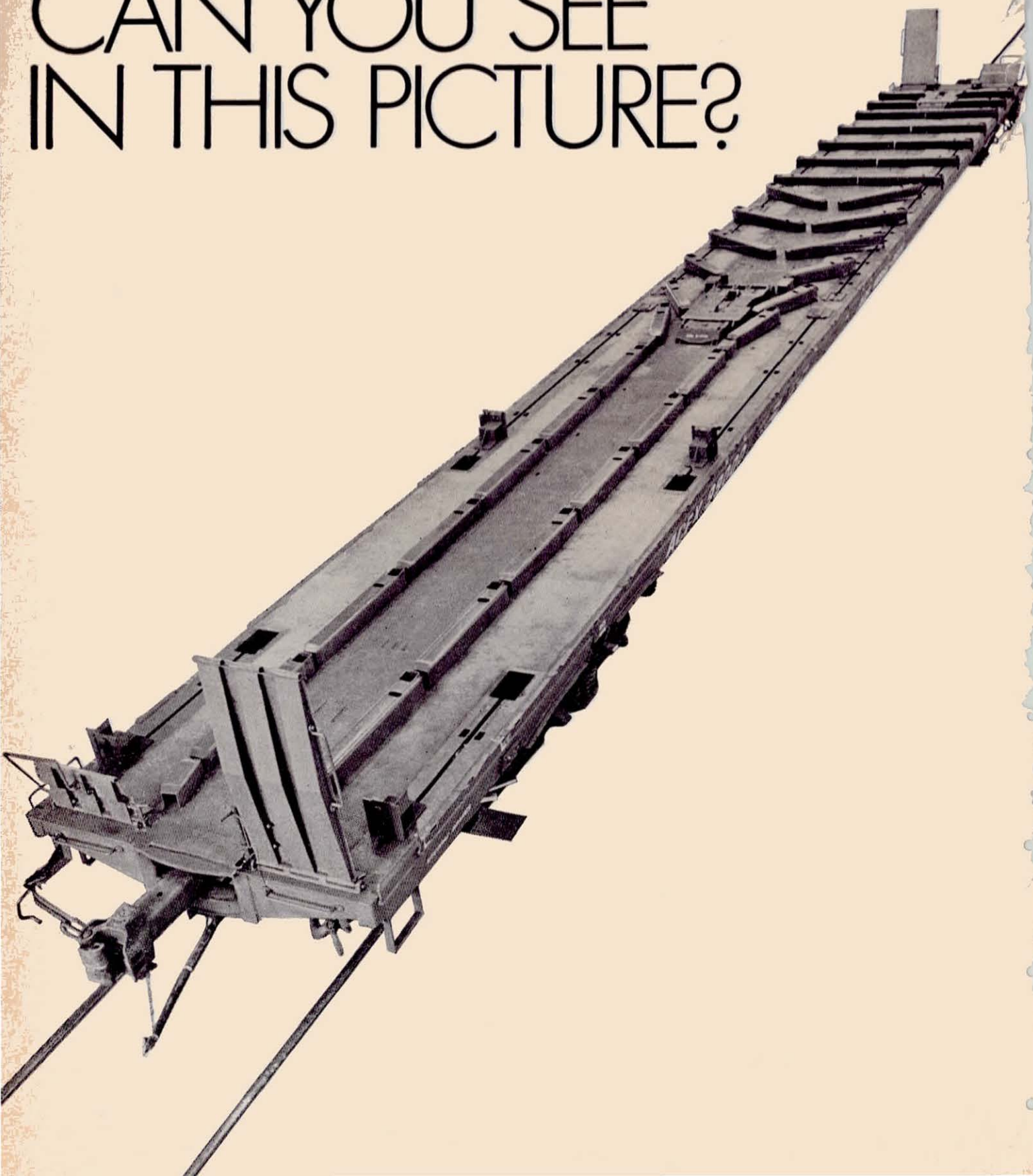

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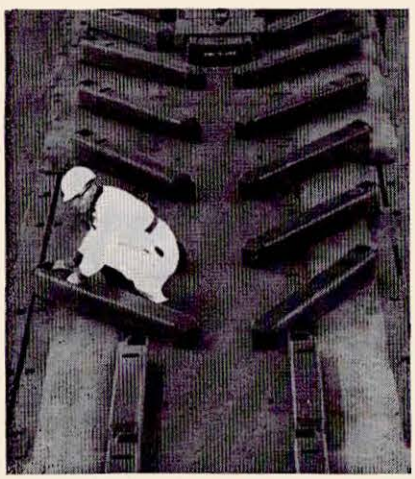

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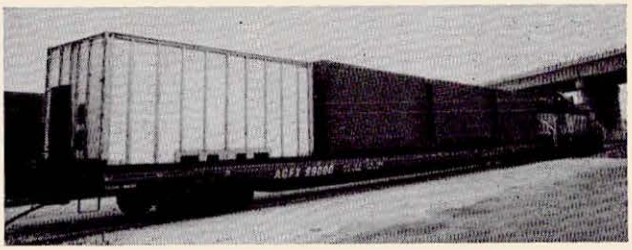
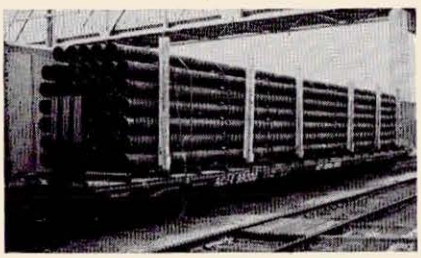


Retractable pedestals adjust to accommodate containers of many different sizes.

The fully equipped Versa-Deck car has all a flat car ever needs: permanent dunnage for bulk loads such as pipes, poles or lumber; adjustable and retractable pedestals for containers; low-silhouette ACF hitches for piggyback service; and ACF's long-stroke Freight-Saver™ end-of-car cushioning. Versa-Deck may end your flat car deadheading altogether. And it's almost obsolescence-proof because Versa-Deck changes just as fast as your needs.



Versa-Deck's 89' length lets you move long loads without employing idler cars.

If you want to know more reasons why Versa-Deck works harder than any other flat car ever built, write ACF Industries, Incorporated, American Car & Foundry Division, St. Charles, Mo. 63301.

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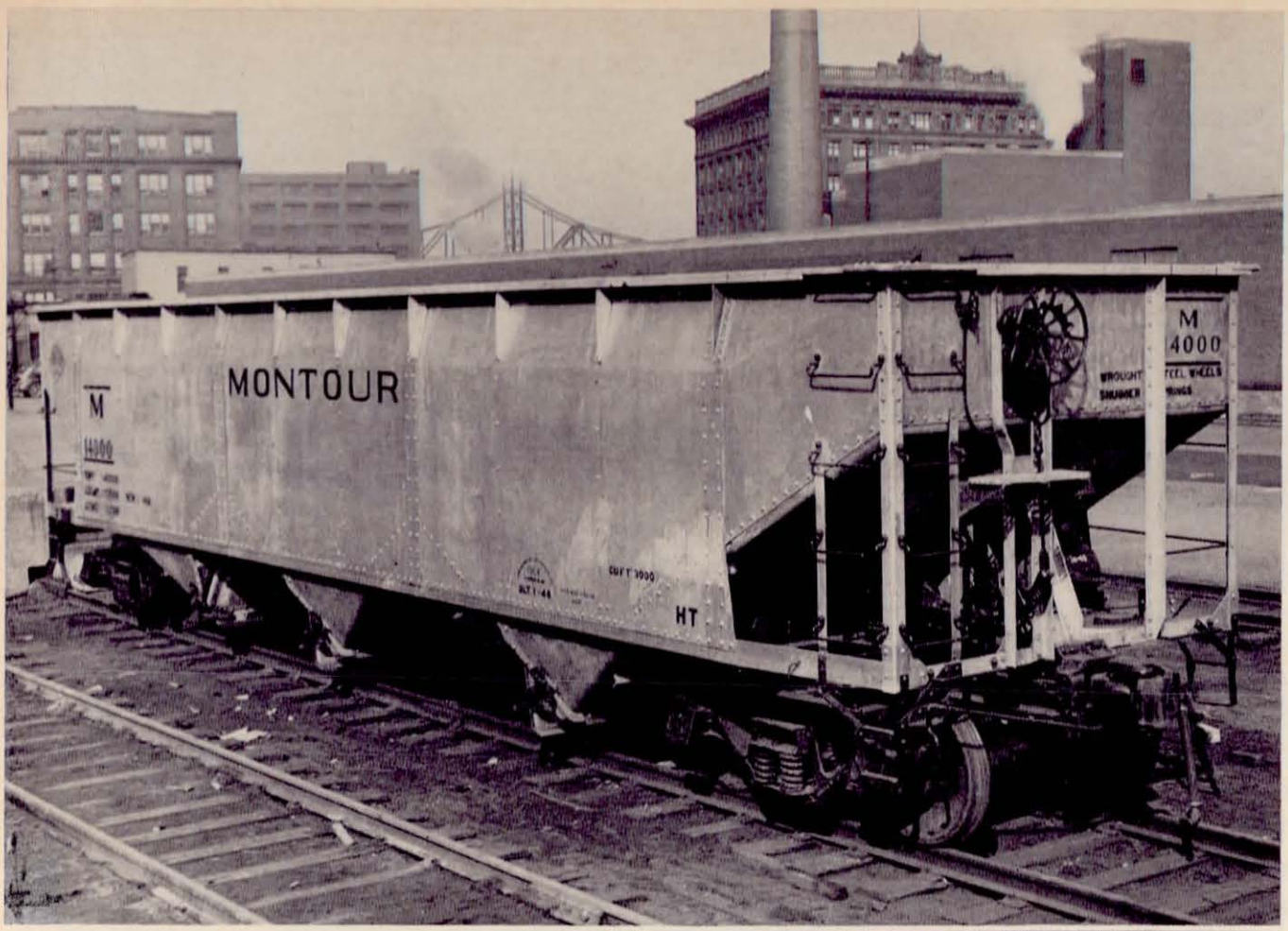
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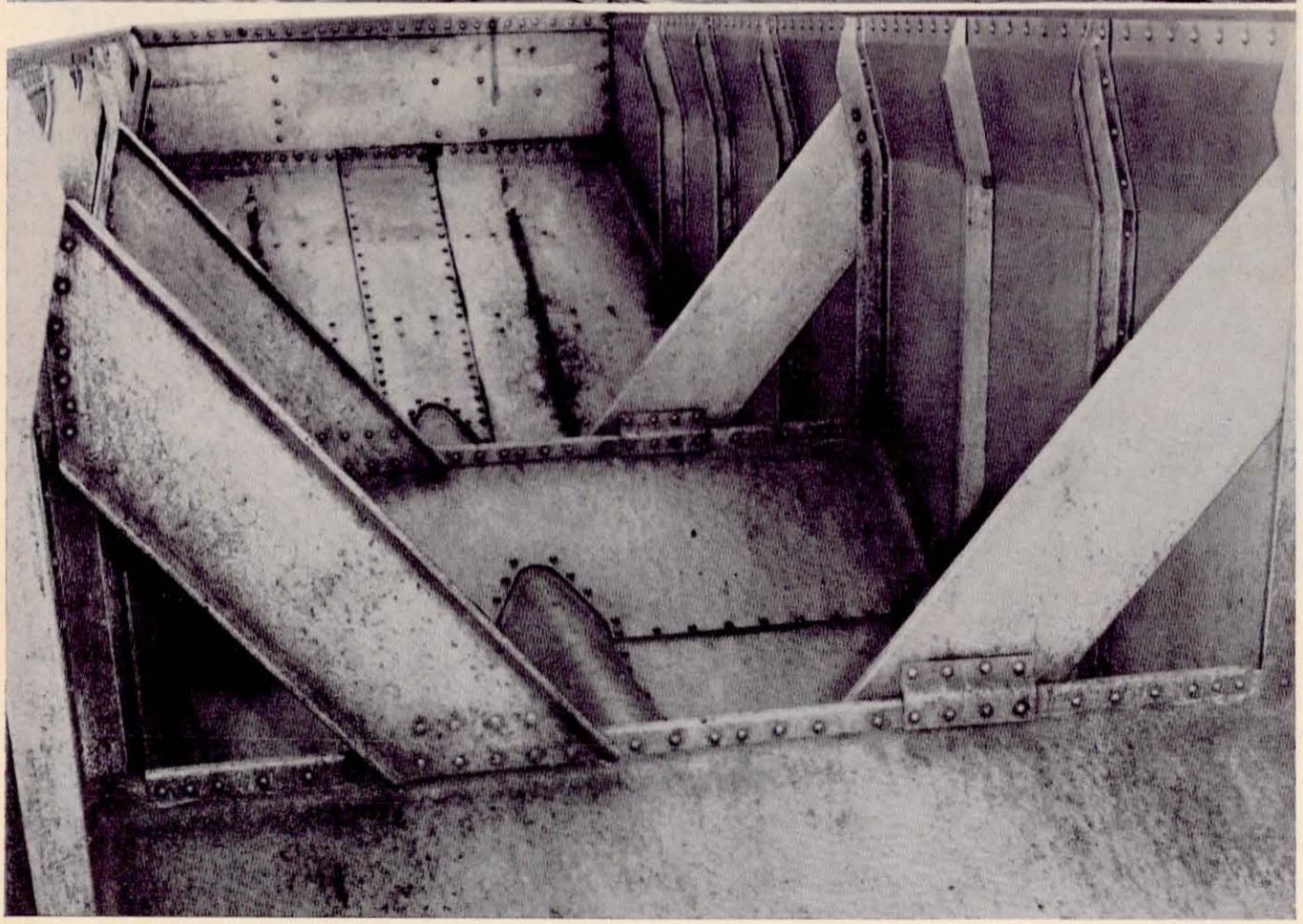

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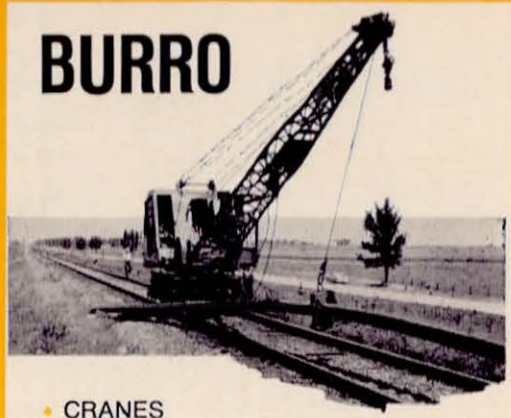

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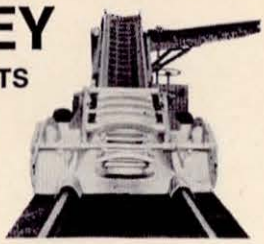

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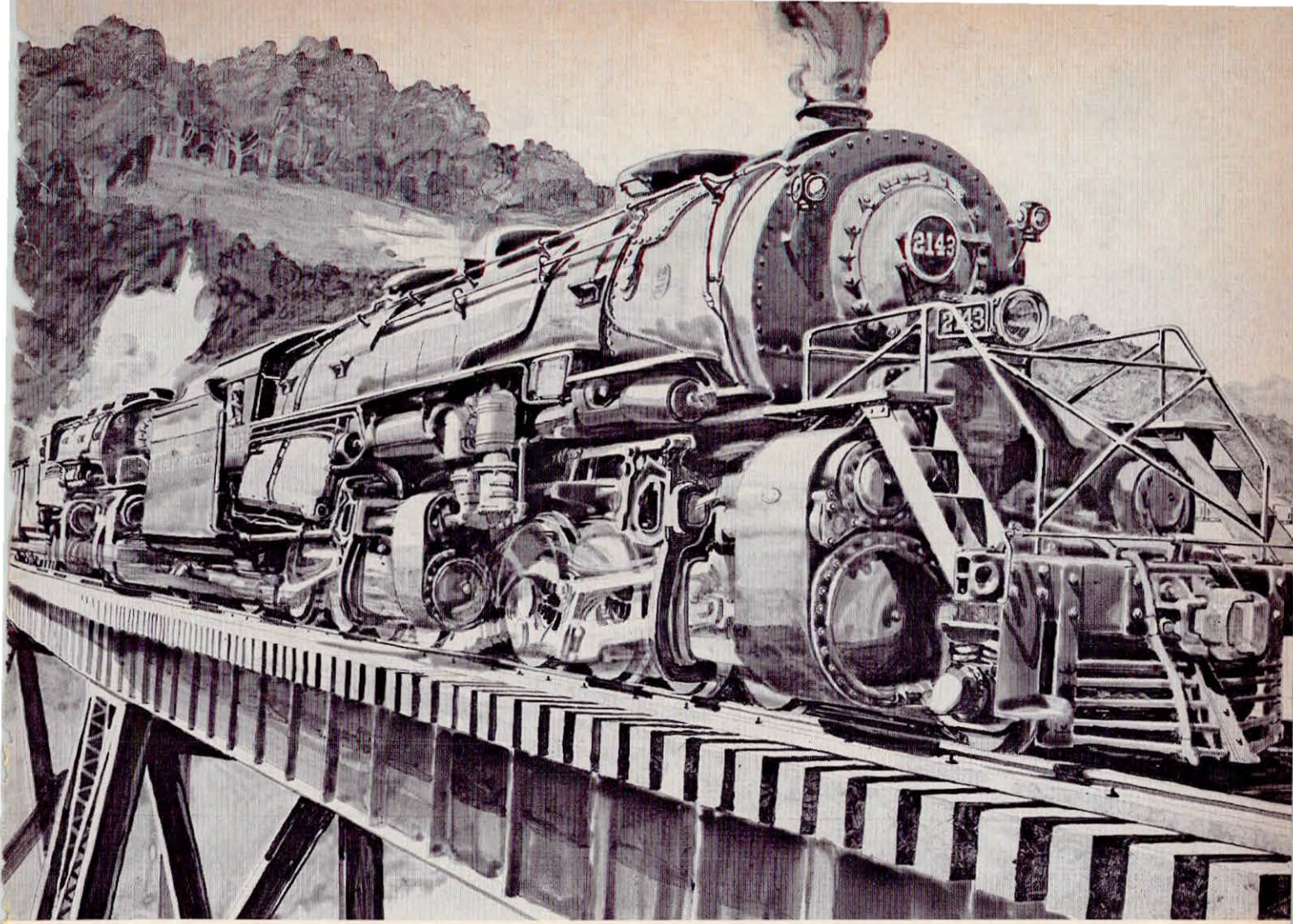

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She was the wheelhorse of the Norfolk and Western: a huge, compound articulated locomotive built in their own shops. They called her the Y-6. With tender she measured over 114 feet and weighed just under 500 tons.

Her 58-inch drivers churned out 152,206 pounds of traction in the first stage and another 126,838 pounds in the second stage. A pair of Y-6s, working in tandem, supplied tremendous motive power to haul N&W's 200-car coal trains over the grades and curvatures of the West Virginia coal fields.

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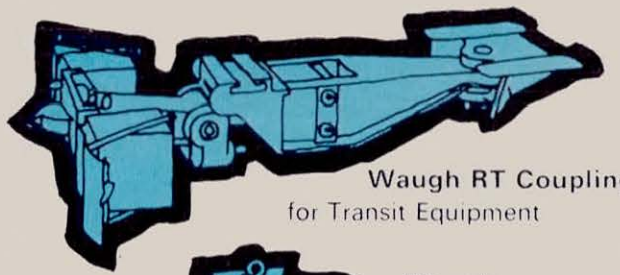

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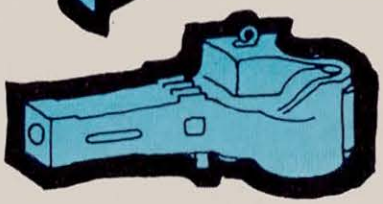

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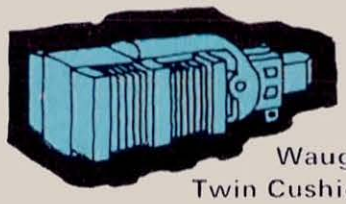

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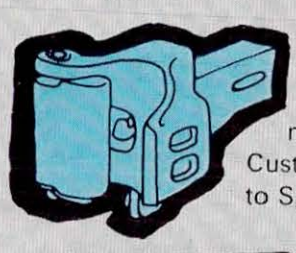

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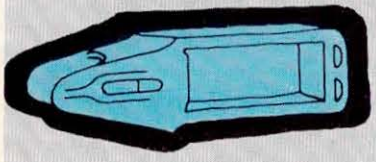

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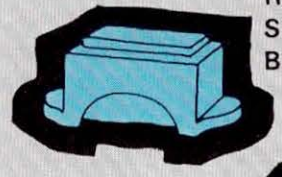

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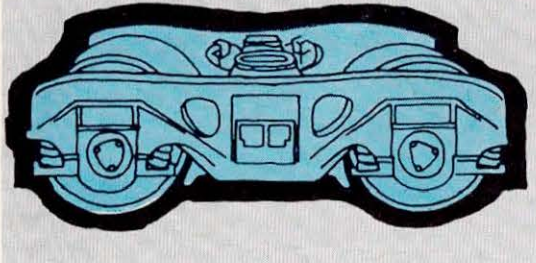
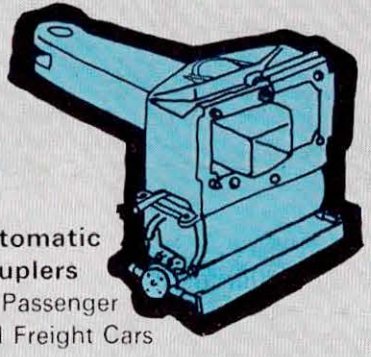
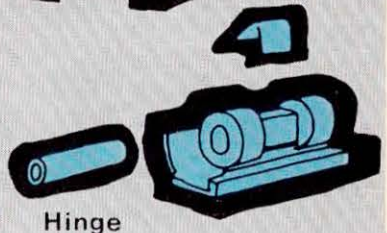




Automatic Couplers for Passenger and Freight Cars



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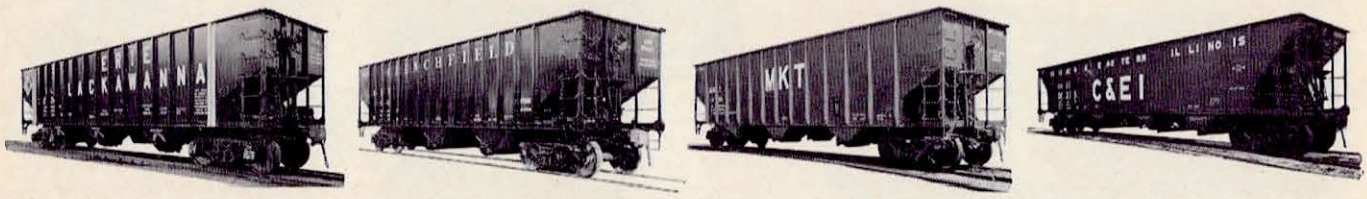
Circle 9 on coupon page 50

What happens if coal captures 10% of the estimated 1980 markets for gasoline and natural gas?



To begin with, this can mean 313 million tons of coal will be required annually for this new market; much of it will move by unit train. If you are involved with coal mining, conversion, burning or movement, it's time you talked with Greenville. Greenville has built more unit coal train cars than any other manufacturer. They're in service. We have cost and performance facts. Call us. We can help you.

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Subsidiary of Pittsburgh Forgings Company
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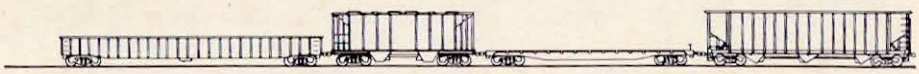
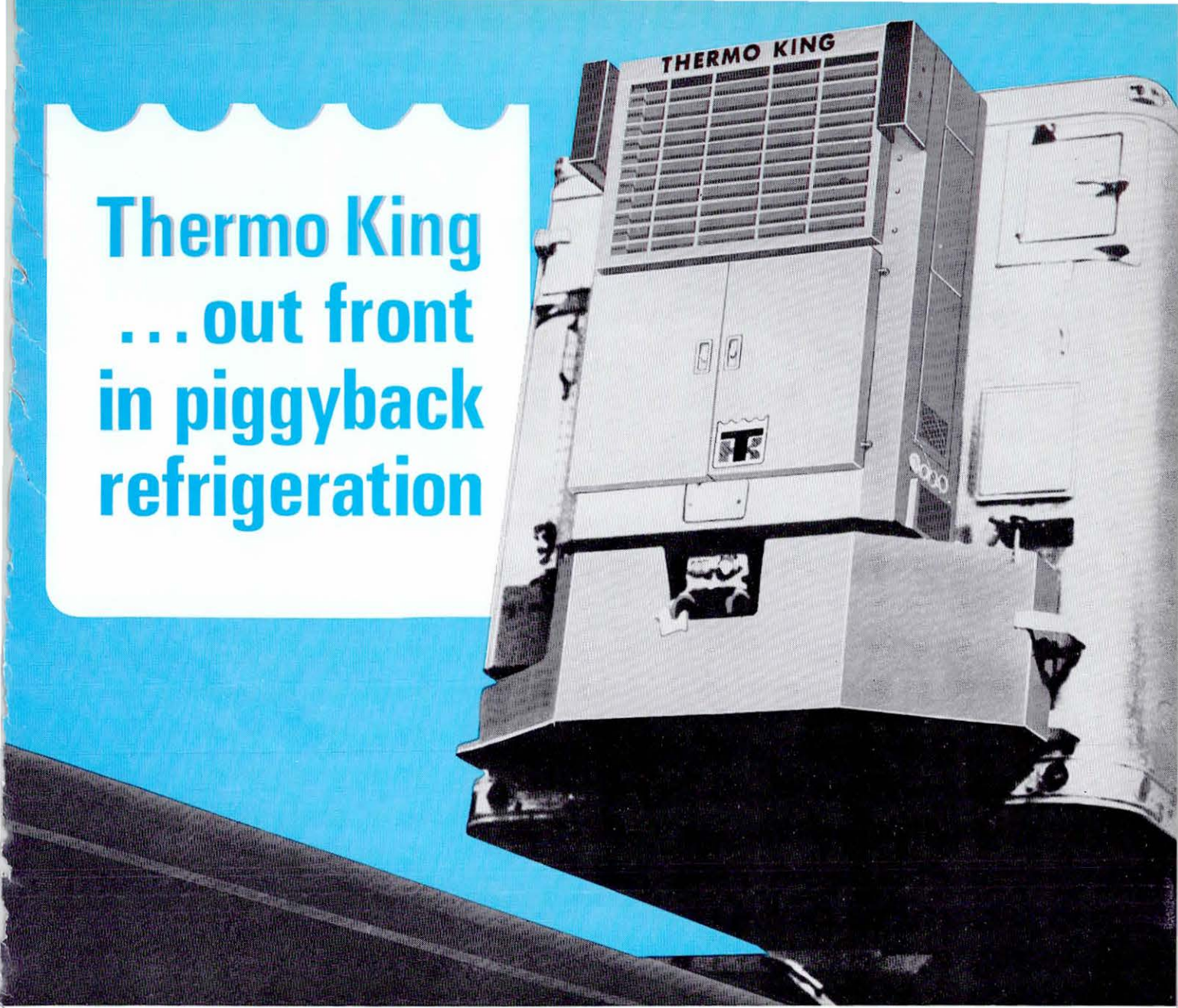


Circle 26 on coupon page 50

Thermo King ...out front in piggyback refrigeration

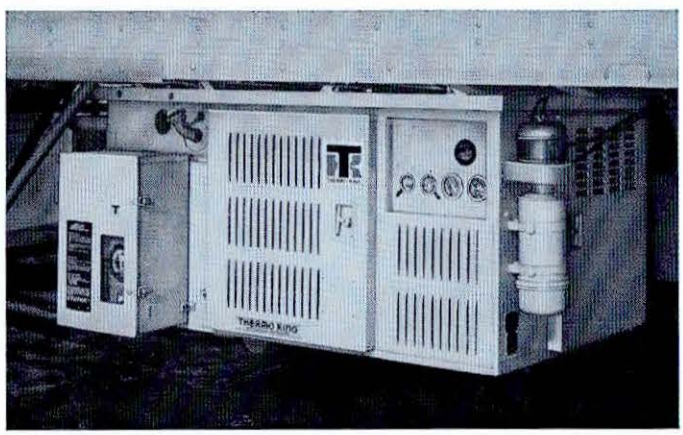


Professional piggybackers rely on special Thermo King frontmount or undermount units for perishable protection

Specially built to the rugged requirements of piggyback operations, these Thermo King refrigeration units keep perishable cargoes at constant temperatures, no matter how long the run or variable the ambients.

In these diesel-powered units, Thermo King has answered the industry need for absolute reliability with extra capacity components, engineering that provides an extra margin of safety, and maintenance features that save downtime and labor.

For information on why Thermo King units mean lowest cost per mile in refrigerated piggyback operations, write Thermo King Corp., Railroad Division, 314 W. 90th St., Minneapolis, Minn. 55420.



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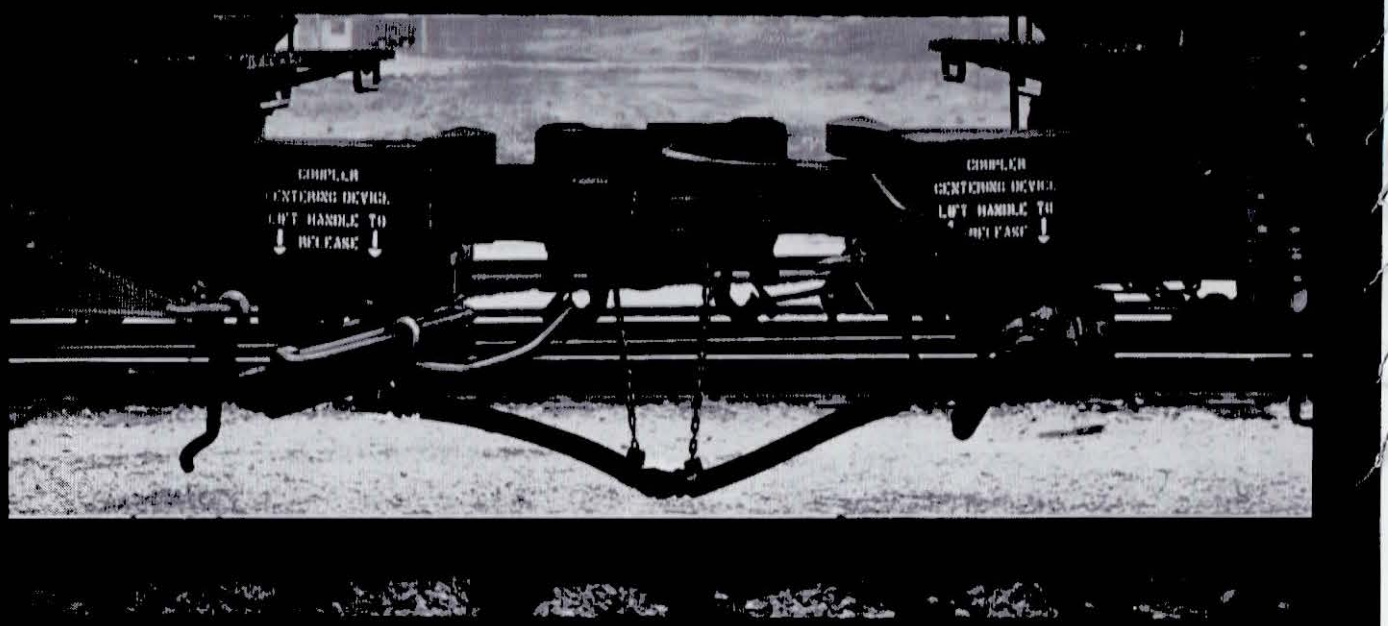
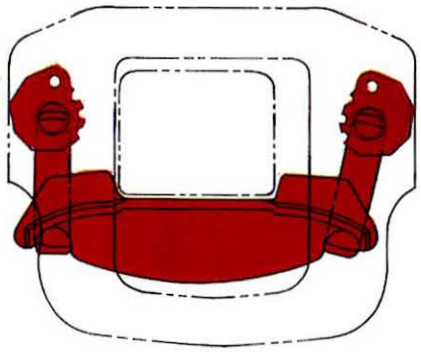


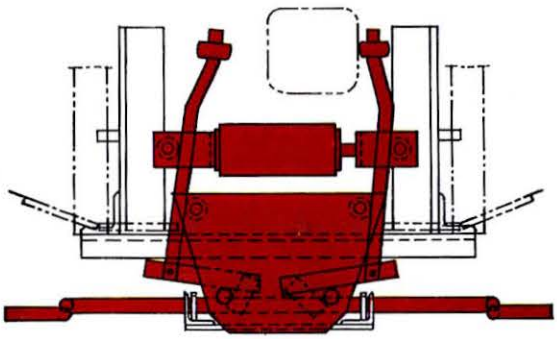
Reduce car damage with these Standard Coupler Centering Devices

By keeping a free coupler centered in relation to the end sill, they minimize the damage brought on by the passing of couplers.

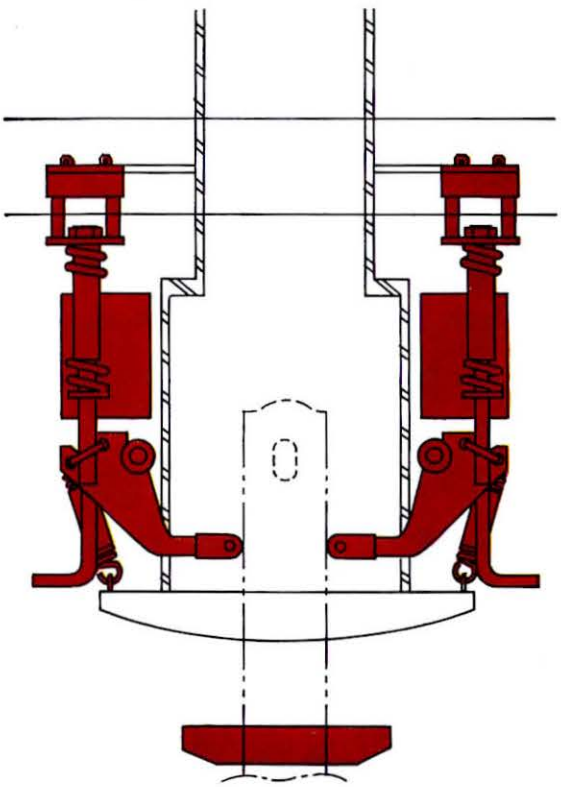
A Complete Family of Standard Centering Devices to Meet All Car Conditions



Swing Type
(includes carrier)



Single Coil Spring
(requires 6″ space
behind carrier and under coupler)



Double Coil Spring
(requires 12″ space
beside bell housing
under car floor)

Today's longer freight cars, with their long-shank couplers and wide-opening strikers, have required new centering device designs to meet the many car conditions. These new designs afford the same protection from damage that the Standard Centering Device has provided for many years—protection that is even more important with today's wide-swing couplers.

With a Standard Coupler Centering Device, the risk of passing couplers is reduced to a minimum. The device keeps a free coupler centered in relation to the end sill. If the coupler is swung wide when disengaged from another, the device instantly returns it to center position.

When the coupler is coupled to another car, the centering device permits all movements essential to safe operation . . . sideways, and up and down.

In using a wide-swing coupler device, there will be occasions when coupler alignment requires that a free coupler be moved off center. If so, a pull on the handle releases the centering device. As the cars move, and the coupler returns to center position, the device automatically re-engages.

Standard Coupler Centering Devices are supplied in four to six components, together with all necessary hardware and simple instructions for installing.

The choice of designs will hinge upon your particular application. Your Standard representative will be glad to recommend the best choice for the job at hand—and to answer any questions you may have.

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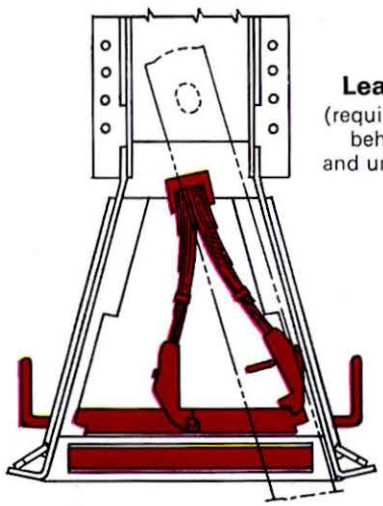
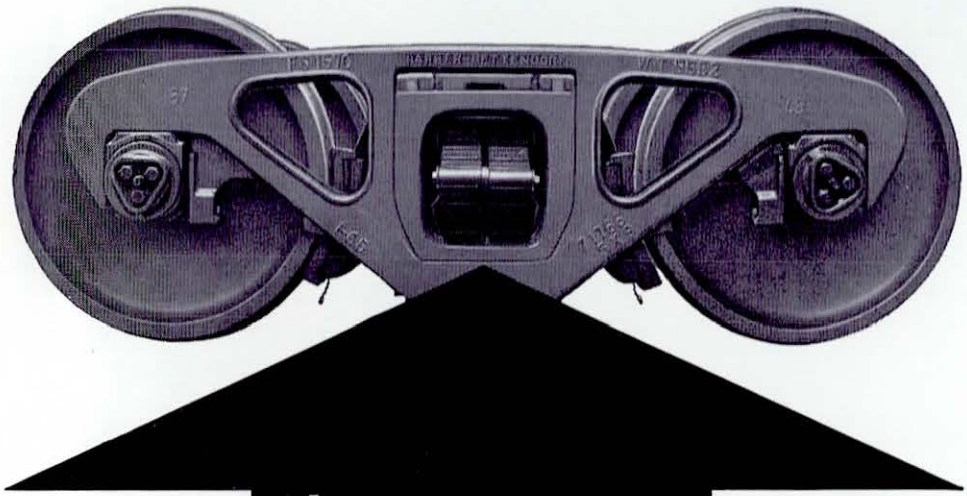


Leaf Spring
(requires 31″ space
behind carrier
and under coupler)

IT'S NO SECRET



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TOMORROW'S RAILROADS

NO. 3
THE VEHICLE AND HOW IT MOVES

Continuing a 12-part exploration of what can and must be done to create the 21st century railroad . . . the 21st century transportation system

BY GUS WELTY

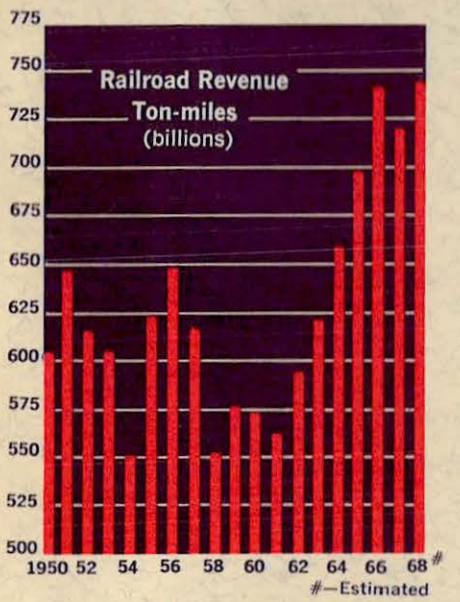
● **Railroading is due**—perhaps overdue—for a new technological breakthrough.

It may come in the powering of trains. It may come in the design of the "train" itself and its component parts. But it will come, because it has to – for the coldest of economic reasons, tied to market demand, competitive demand and the ever-present pressure of increasing operating cost.

● **The word "breakthrough"** is not easily applied, in considering railroading's technological progress. Railroading is a business more tuned to evolutionary than to revolutionary change. The nationwide system, made up of hundreds of independent companies, large and small . . . the "do-it-yourself" tradition established by the industry's rugged individualists . . . the inbred, up-from-the-ranks nature of railroad leadership advancement . . . even the frustrations of competing in a badly-structured transport universe—all these factors, and others, have played a part in making railroading a trade in which one looks very long and very carefully before one leaps.

Now, however, there are signs—in railroading, in the railway supply field, in government—that this industry may be ready to strike out more boldly and with greater innovative flair. The bold look embraces both the equipment and the way it moves. Development of an improved plant (Tomorrow's Railroads No. 4, April) is not being

Rail ton-miles dip, then rise again...



overlooked. But for good reasons—mostly economic—the prime present concern is with railroading-above-the-rail.

● **Rail equipment—the whole concept** of a "train"—is getting the kind of critical study it hasn't had for years. There is a growing theory that too much attention in equipment design has been paid to helping railroads *get* business, and too little paid to helping railroads *move* business, once it's obtained. It is no laughing matter, when railroad men hear the freight car described as "a little jewel . . . pretty fancy from the frame up. But as a piece of gear needed to produce a quality transportation product, it tends to be some kind of a bad 19th-century joke."

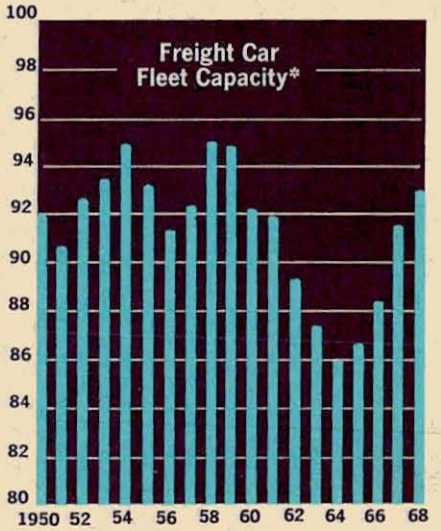
Nobody, shipper or carrier, can quarrel with the imaginative design work aimed at that part of the vehicle which actually carries the freight. Nobody can argue with the continuing improvement in individual-component areas—couplers and draft gear, braking systems, cushioning systems, truck designs.

At the same time, some will say that what's really needed is a fresh look over-all—the kind of look one company is taking now with its own design program. The basic idea in this R&D effort isn't complicated. It makes use of known components. It's an adaptation of a concept often toyed with but seldom seriously considered – the multiple-wheeled vehicle with each wheel individually suspended and powered. If it works as its backers say it can, it could offer significant transportation, mechanical and shipper advantages.

Where do the potential advantages lie? A low center of gravity, with containerized loads, will permit sharply

increased speeds. More even application of acceleration and deceleration forces will be possible. The multiple-wheel feature will provide better load distribution. Higher speeds and/or heavier loading should be possible without extensive and expensive re-working of the track structure. And the whole nature of operation with this kind of vehicle should sharply reduce damage to lading.

...while fleet capacity reacts sluggishly



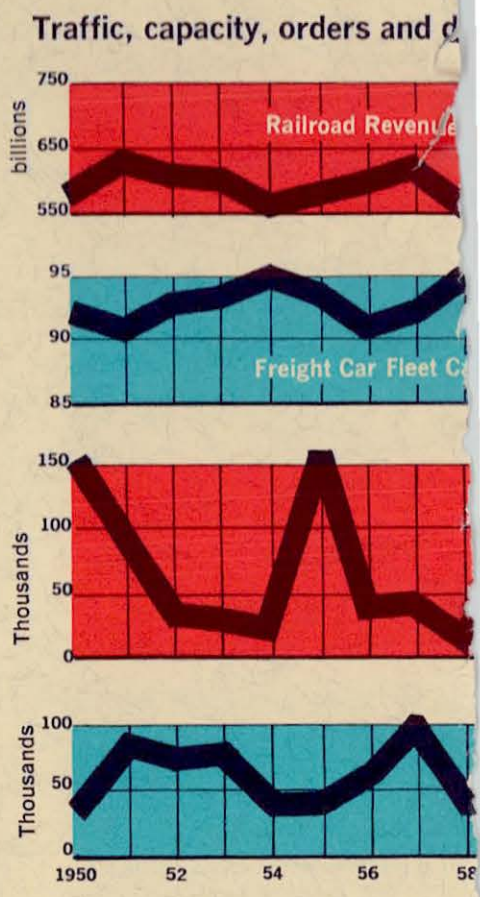
*—Class 1 roads, millions of tons, as of Jan. 1

● **Central to any consideration** of equipment breakthrough, of course, is the whole pattern of operation as it will be created in the late 20th century and beyond. The spread of the short, fast train concept, for instance, or the increased use of equipment in dedicated service would make innovation more practicable by easing some of the design restraints involved in fleet compatibility.

Other restraints, however, may not be so readily removed. There are size and capacity limitations imposed by the shape of the fixed plant. There are structural requirements imposed under present theories of operation: If a car must be built to be capable of operation in a freight train, it automatically has a rugged structure which has to last—or, as one mechanical expert puts it, "you would need real ingenuity to design a car which could transmit more than 200,000 pounds of pull or resist more than a million pounds of buff, and not be a long-life proposition." Unrealistic depreciation requirements also contribute to this long-life design of rolling stock. And the result can be operational and/or market obsolescence, long before a car—as a structural thing—is really worn out.

● **Researchers are looking** in several directions, in an attempt to cut loose from these restraints. The individ-

ually-powered vehicle is one possibility. Greater use of articulation principles is another.



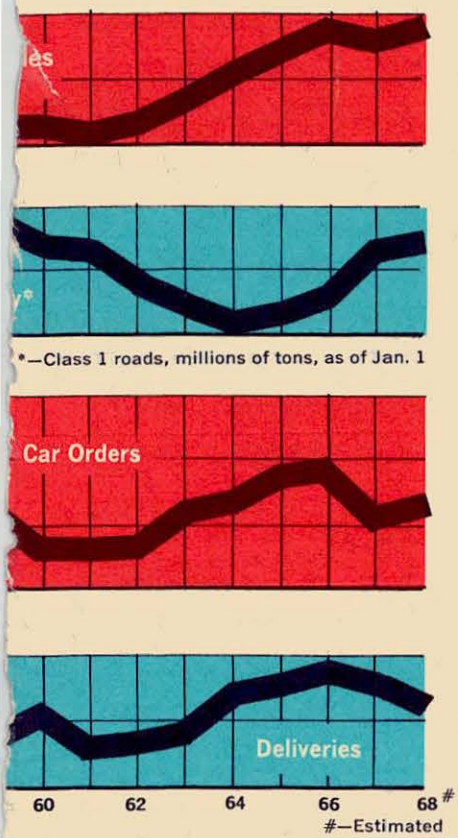
● **While railroad and carbuilder R&D people** are probing the 21st century, power-system developers are working in no-less-intensive fashion. The diesel-electric era now stretches back for roughly 30 years. It may go on for another 30 or more—but only if the diesel-electric continues to justify itself economically. In the meantime, the builders are doing their homework—aware of and working on such power systems as straight electrification, the turbine, the heat-exchange unit, even the linear electric motor.

At this point, the most serious competitor to the d-e is the straight electric. Designers have not been able to create a perfect marriage between the turbine and railroad operation. The other, more exotic power units still need much work before application can be practical or justifiable.

For years, railroad electrification has been described in the same terms applied to containerization: It has a great future—and it always will. Now, containerization is coming on. Electrification may, too, under railroad/power company arrangements which would relieve the railroad of the enormous capital costs involved in starting-up.

● **Several factors are working** to promote electrification. Projections point to a tremendous increase in the availability and use of electric power over the next 30 years. Among all present transportation modes, railroads

ies: The trends don't match



*—Class 1 roads, millions of tons, as of Jan. 1

#—Estimated

are in the best position to make use of this power—and they represent a great untapped market for the electric utilities, second only perhaps to the market in electric heating.

One long-time student of electrification, with a view toward super-railroads, states the case this way: "To the degree that faster train speeds and growing traffic densities must be accommodated, there is possibly justification for electrified operation which may have been lacking before. . . . Important operating advantages are available through the electric locomotive, including greater horsepower and tractive effort per unit for increased hauling capacity, more operating flexibility and availability, reduced maintenance costs, longer economic life and more over-all intensified use of the physical railroad plant."

But don't write off the diesel-electric. Right now, the builders are looking at two new generations of d-e power —characterized by higher single-unit horsepower, an extremely flexible mid-range in horsepower and in all units a further improvement in operational reliability. As much as 8,000 hp may be packed into a single unit, at the upper end of the scale. Demand will continue for power in the 2,000/2,500-hp area. High- or mid-range, the emphasis will have to be on dependability.

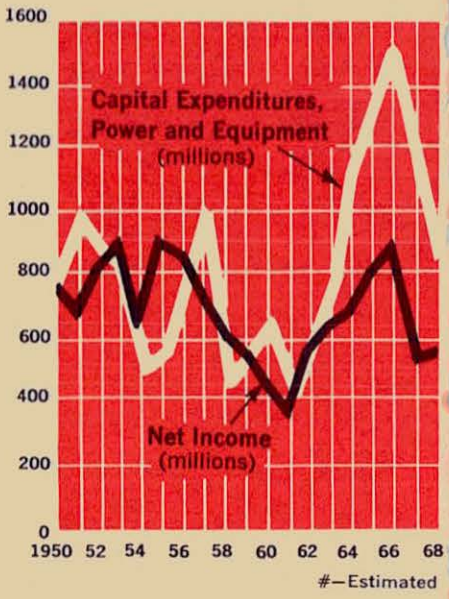
● **And in powering tomorrow's railroads,** the diesel-electric will be a powerful competitor. Unit cost per horsepower has come down, to offset in part the increasing cost of fuel. Railroads have been able to do more business with fewer units of power. One builder sums it up: "If the railroads want an electric locomotive, we'll build it. If they

often as not the opposite is true: Capacity and traffic-handled move in opposing directions, orders and deliveries lag behind real-time need, while GNP (as one measure of available business) climbs steadily.

Solutions to this kind of problem are easier stated than effected. Possibly, the answers lie in faster and more accurate market forecasting, expansion of leasing or pooling operations, development of long-range equipment programs which retain an essential flexibility but still provide a measure of order/delivery stability.

It could be argued that the term "breakthrough" is a bad one to use in forecasting the railroad industry's power/equipment future. But by at least one dictionary definition, it's brutally accurate: "Breakthrough – the act, result or place of breaking through against resistance, as in warfare."

Equipment spending: Greater than net, more often than not



● **To any sharp change** in technological direction, there will be resistance. If there is to be a sharp change, or even a speed-up in evolutionary technology, there must be a dedication or a commitment not unlike that of Grant before Richmond or Churchill in the Battle of Britain. Railroads, one long-time observer muses, are not used to making the long-term commitments which may be needed in shaping tomorrow's railroads. But they're going to get used to it, because there may not be any alternative. And the signs of commitment are showing up—in bolder research, in new dedication to planning, in a willingness to challenge the past and, most importantly, in a willingness to challenge the future.

Coming April 21
Part 4:

THE FIXED PLANT
WHAT IT WILL
BE LIKE ON
TOMORROW'S
RAILROADS

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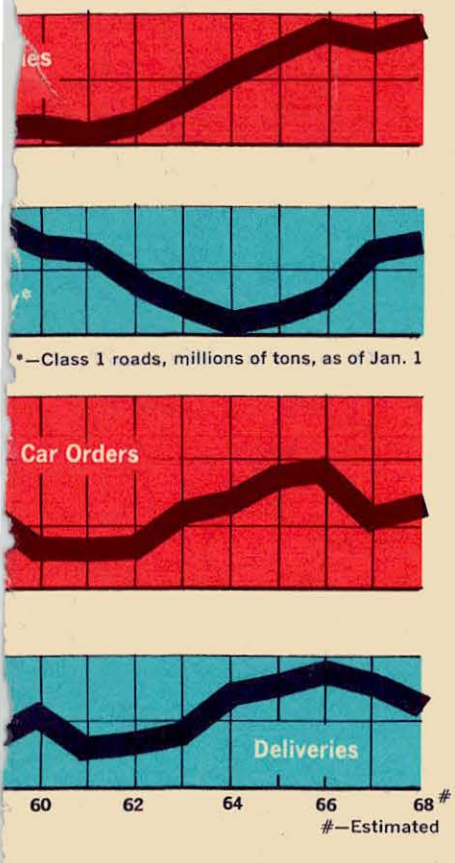

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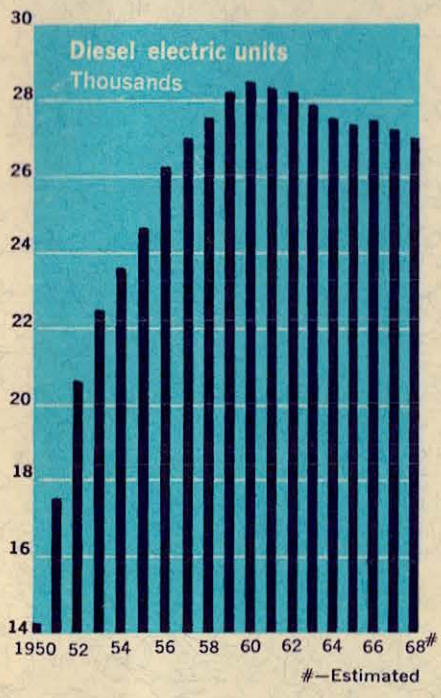
Power ratings climb, but fleet size stays the same...



want a turbine, we'll build it to the best of technological capability. But railroads, and the rest of these people talking about new kinds of power, had better remember one thing. The diesel-electric is a moving target. I hope the people plugging new kinds of power are fully aware of where we are with the diesel-electric."

If you paraphrase that just a bit, there's one conclusion to be reached: Advances in the state-of-the-art with the d-e are the biggest deterrent to a plunge into electrification or something else. And the next 10 years should show whether new economic factors or operational demands can overcome the diesel's edge. From a strictly practical standpoint, this seems less than likely.

● **From a political or social standpoint,** however, there's cause to wonder—as, for example, in considering what might happen if some ordered-reassessment of natural-resource consumption might be made. Railroads could then wind up as consumers of central-station nuclear power, while fossil-fuel products are assigned to the air and highway carriers which have less capability for use of generating-station output.

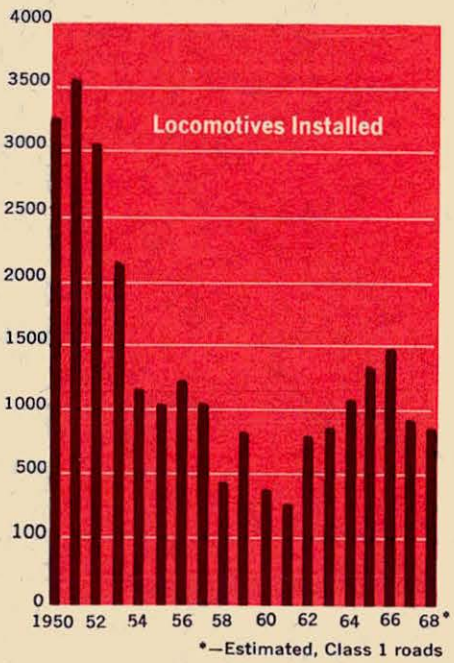
Be it equipment or power, however, hardware is just one aspect of freight-hauling technology. Theories of supply and management—call it the software—will be no less important in determining where the industry will be, as the 20th century bows out.

● **Top-flight management is asking** a lot of questions—conceding that railroads have not-infrequently neglected long-range planning, and knowing that the penalties for

this neglect cannot be long endured. Among the questions —some basic, some far-out:

Does a railroad belong in the carbuilding business, or will the captive carshop go the way of the captive locomotive-erection shop? Should a railroad actually supply freight-carrying vehicles, or should its responsibility end with supply of route and power? Are railroads investing wisely in equipment, or are decisions being made without proper foundation? What's going to happen as railway suppliers in increasing numbers diversify into other enterprises? Can power and equipment purchases somehow be stabilized, to help suppliers maintain their production capability and to put new equipment to work when it's needed and not after the fact? Can labor and governmental restrictions be eased, so that maximum benefits can be obtained from whatever new technology is developed? Has transportation become more capital-intensive and less labor-intensive, to a degree where imbalance hurts?

...and the market is largely a replacement market



● **To an increasing extent, managements** are questioning both the planning and the timing of technological investment. A top financial man, for instance, looks at the situation and wonders: "Maybe it's time to hold back on this headlong rush to buy . . . and take another look. In transportation, the reward for inept investment is painful erosion of assets." Timing of equipment acquisitions is another, but related, problem. Ideally, trend-lines for GNP, railroad fleet capability, traffic handled and equipment ordered/delivered would show up along generally parallel courses. They don't. As the charts indicate,

often as not the opposite is true: Capacity and traffic-handled move in opposing directions, orders and deliveries lag behind real-time need, while GNP (as one measure of available business) climbs steadily.

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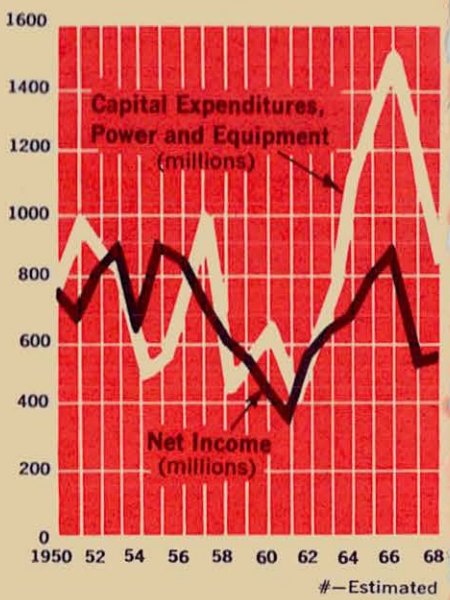

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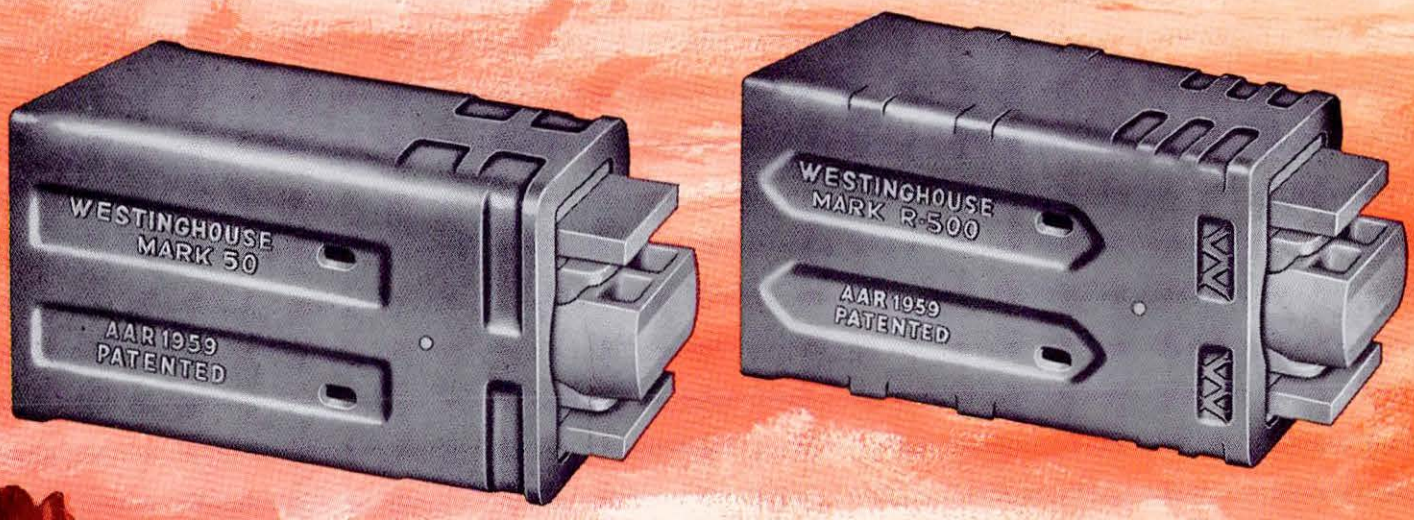
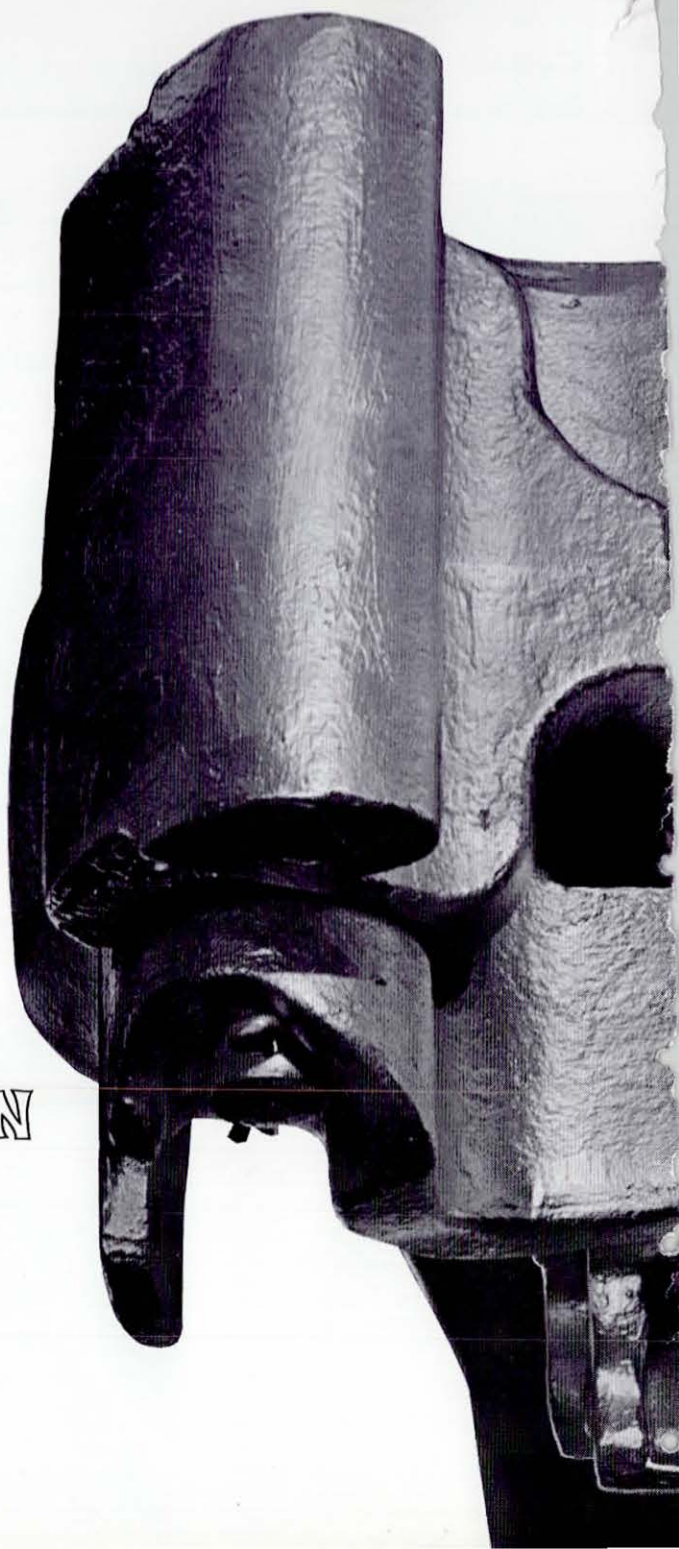


HERE'S A REAL GRA



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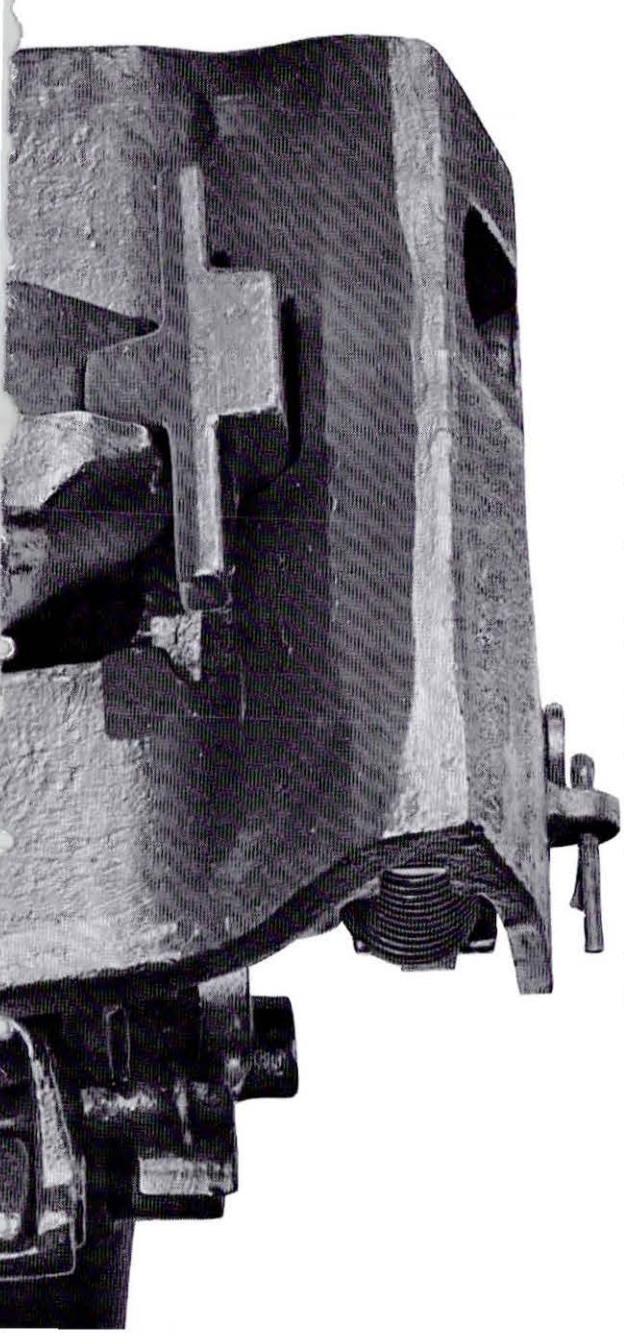

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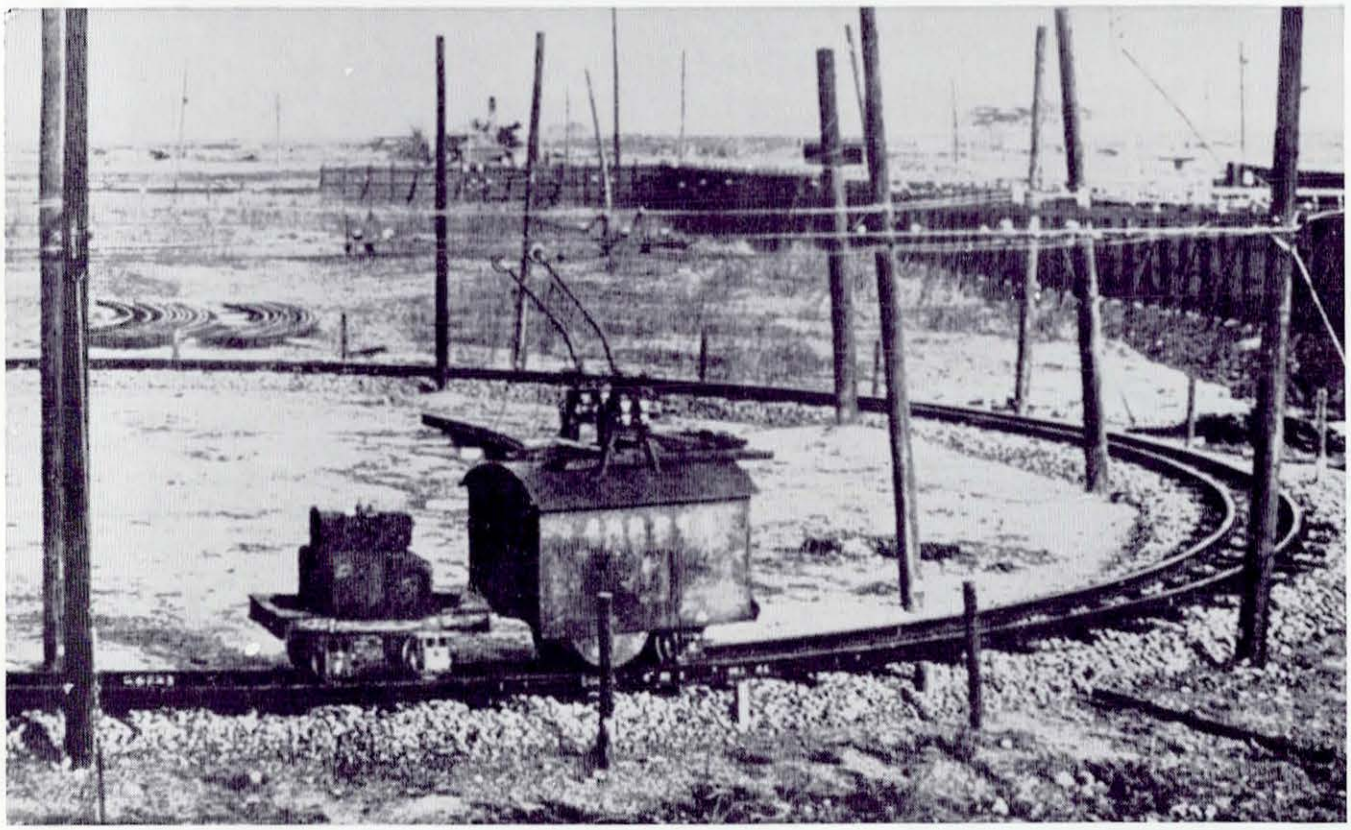
Sumitomo is the first foreign rolling stock parts maker to get AAR approval.

Is a history of original research the reason?



This photograph is 40 years old.
We took it at our Osaka Works in 1928 during a ten-year study of the abrasion of rails and rolling stock, in collaboration with the Japanese Government Railways. And presented the results of the research at the 2nd International Rail Assembly in Zurich in 1932.
The unusual thing is that today these results are still regarded as definitive. Nobody else has ever had to do this kind of research.
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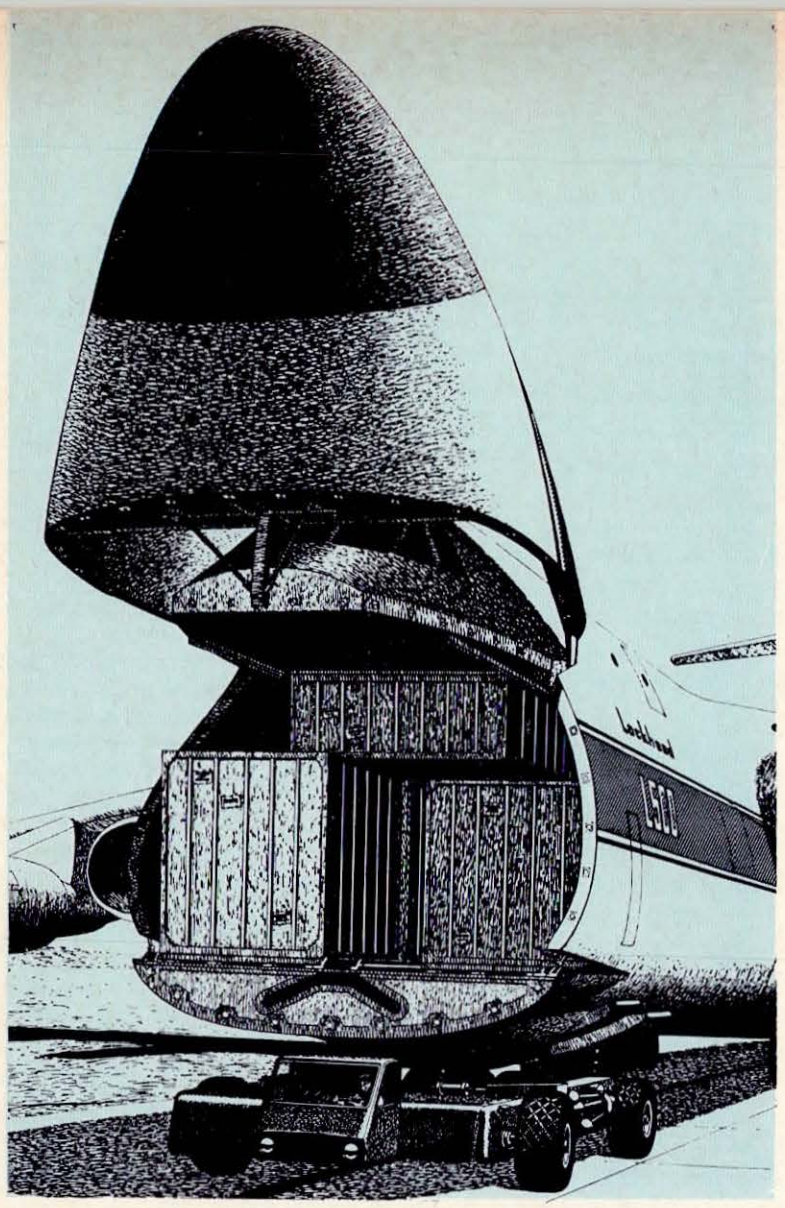

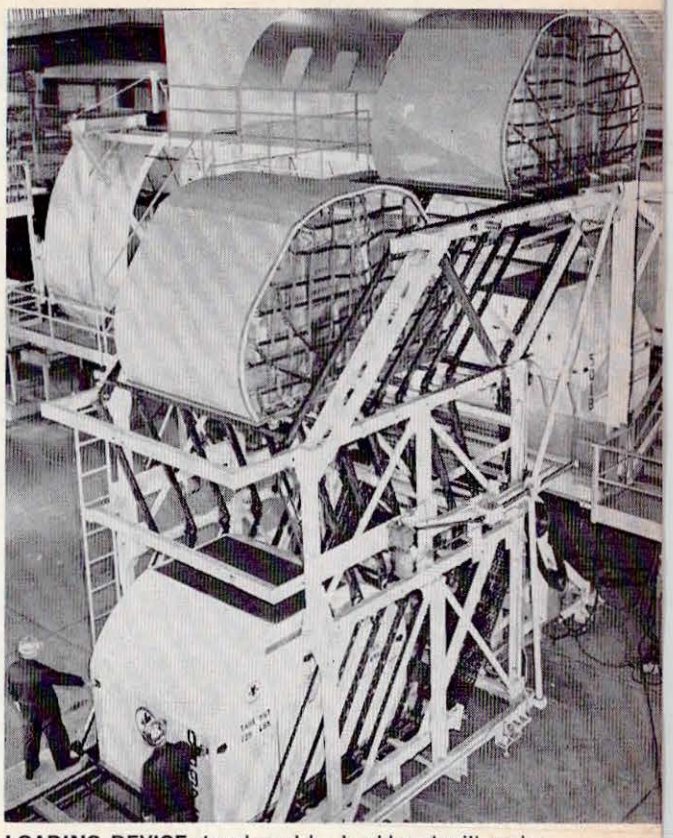

LOADING DEVICE developed by Lockheed will make possible loading and unloading of company's L-500 in 30 minutes. Payload of jumbo jet: 150 tons.

LOCKHEED JUMBO JET is modified version of military plane. It will be loaded through visor nose. Builder promotes airline use of all-cargo craft.

Jumbo jets worry the airlines

Delays on the ground may negate the advantages of giant high-speed cargo planes.

Before they have been placed in service, the airline industry's jumbo jets are being hailed by manufacturers, carriers and shippers alike as the machines that will carry transportation into the space age. Carrying payloads of more than 100 tons at speeds up to 600 mph, the huge planes may enable the airlines to capture a significant share of the country's intercity traffic.

• **But there are problems.** The expected arrival of the jets next year has caused railroad executives to wonder—aloud and publicly—whether they will be able to cope with the challenge of the high-speed, high-capacity planes. But if railroad men are worried, so are the men who are buying the jets. At a seminar sponsored by the Institute of Airline Marketing in New York this month, airline experts made it clear that the jumbo jet will create problems before it brings prosperity.

With less than 1% of intercity traffic, aircarriers will be expanding their capacity far beyond their immediate requirements. Air cargo presently is more often than not a deficit operation. In the next few years, capacity will go up, load factors will go down and air cargo operations will exert considerable pressure on airlines' profits.

As traffic increases—as it will—airlines will be hard pressed to develop ground facilities capable of handling the jumbo jets' payloads quickly and efficiently. Ground technology, noted more than one speaker at the New York seminar, has not kept pace with air technology.

• **Hedging their bets.** Technology is not the only ingredient required for the development of ground facilities. Land and money—in large quantities—will also be needed, confronting the air carriers with the prospect of capital expenditures in an area where their confidence in the future is, at best, cautious. Scheduled airlines have hedged their bets on the cargo business by buying convertible aircraft; if cargo volume doesn't increase rapidly, the planes can be used in passenger service. Pan American exhibited the equivocation of the entire industry when it first ordered a few all-cargo jumbo jets, then changed the order to all convertible aircraft.

The equivocation is understandable. Passenger traffic produces the profits for

Frank Malone

WATCHING WASHINGTON

THE GREAT CONGLOMERATE DEBATE finds House Ways and Means stealing first thunder. But the committee's broad-based look at tax loopholes that aid big-company takeover by small investors with doubtful competence to manage varied acquisitions is just one route that may appear.

COMMERCE COMMITTEE CHAIRMEN Warren G. Magnuson (Senate) and Harley O. Staggers (House) are pushing specifically against carrier takeover by parties without transport skill. They say the public interest demands sound management of essential transport service regulated by the government.

COMMERCE ACT CHANGES, as proposed, would require an acquiring party that isn't a carrier to "be engaged primarily in the business of transportation or a related business." The Interstate Commerce Commission would judge the adequacy of such "engagement." In the Senate, Colorado's Gordon Allott and Peter H. Dominick join the push. They are concerned about advances by a young New York investment group toward the Denver & Rio Grande Western (RA, March 3, p. 8). Also, Staggers presents further amendment: a non-carrier can acquire a carrier only with ICC authority. There are similar proposals to give the Civil Aeronautics Board final say in air carrier takeovers.

THE NEXT MOVE on the amendments would be hearings by the entire Commerce Committees or by their subcommittees. Last week, the full Senate Committee started hearings on air carriers, and that may be a precedent for action on the others. If subcommittees are used, special ones might be formed in both House and Senate. There will be tough questions: what is a "related business," and how does a regulatory body decide that a party that is neither a carrier nor a related operation should be allowed to proceed?

A THIRD APPROACH may come from the Interstate Commerce Commission. Hill activity may hasten a Commission decision on whether it should find out what happens to the public interest when a railroad itself becomes a holder of diverse interests. Such a probe is recommended by Henry C. Darmstadter, ICC examiner, in his report for the Milwaukee-Chicago & North Western merger. He wants clear definition of the "rights, obligations, opportunities and incentives" of the holding company to strengthen its rail subsidiary for the public good.

the airlines—and it will continue to be the best revenue producer for most of the 1970's. Securities analyst Marcel P. Gaspar of Wood, Walker & Co. doesn't expect revenues from freight to match revenues from passengers until 1975. Gaspar says it may be another five years after that before freight can contribute as much to profits as passengers do.

Airline industry revenue figures substantiate Gaspar's analysis. Pan American, for example, gets 33.4 cents per revenue ton-mile from all of its traffic but only 18.9 cents per revenue ton-mile from cargo. Stated another way, cargo accounts for 21.2% of Pan Am's traffic, 12% of its revenues. Passengers, obviously, produce the profits.

Trying to avoid the downdraft on profits while continuing to challenge surface carriers, the airlines have been using combination planes—passengers on top, cargo in the belly. "The cargo," says Gaspar, "is subsidized by the passengers."

Understandably, Gaspar is "pessimistic for the prospect of profit for air cargo before 1973," and counsels carriers "who would like to make money to be very patient."

• **Growth rate of 18%.** Gaspar predicts an annual growth rate (compounded) of 18% through 1980. Other speakers at the seminar predicted a similar sustained growth at the expense of surface carriers, assuming at the same time that rates for cargo would decline while the cost of moving freight on the ground would rise.

That assumption, however, avoids a basic problem brought on by the jumbo jets: interchange of freight between modes becomes critical in reducing costs and total transit time. Air cargo will have to move from point of origin to terminal to airport before the jets can do their job. And at the other end, the cargo will have to move from airport to terminal to destination. In that procedure, transit time between airports looms less important than it may seem. Further, not all airports will be able to accommodate the jumbo jets and cargo carried at jet speed part of the way may have to roll along highways at mundane speeds for considerable distances.

The jets may lower airlines' direct operating costs for cargo—but not by much. The cost per available ton-mile in domestic operations presently is nine cents. Gaspar, for one, doesn't think it will go below five cents. "There is nothing in the air or on the ground that would substantially lower costs before 1973 or 1975," he says.

To keep costs down, airlines will have to take steps to assure that cargo moves quickly on the ground. To trucking executive Arthur Imperatore the

(Continued on page 52)

TRAIN car-finding system is getting its first workout

Very shortly, at least two railroads will be sending data on cars delivered in interchange to the AAR's Washington headquarters. This will be the initial phase of testing for the TeleRail Automated Information Network (TRAIN).

This information network is designed to provide timely, accurate and complete car information to "enable the Car Service Division of the AAR to more effectively fulfill its role in balancing and allocating the national car fleet with respect to shipping demands," says R. B. Curry, vice-president, management systems department, AAR. It's targeted for industry-wide application Jan. 1, 1970.

● **Computer will poll.** Heart of the TRAIN system will be an IBM 360 Model 40 computer with transmission control units, disk files and associated hardware including input/output equipment.

Using three AT&T WATS (Wide Area Telephone Service) lines, the computer will dial each of the 65 participating railroads on a sequential basis 24 hours daily, seven days per week. Four types of data transmission terminals will be used by the roads and at AAR's TRAIN headquarters:

—For low volumes (roads reporting less than 1,000 cars daily in interchange), equipment will be Teletype Model ASR 33 or IBM 1050 units.

—For high volumes (roads reporting over 1,000 cars daily in interchange), terminal units will be AT&T's Data Speed 5 or IBM 2780 units.

Two-way communication is available. A road can have interchange information in its terminal unit for transmission to Washington. Also, it can have an inquiry for TRAIN ready for sending.

All Class 1 roads will report interchange delivered and also interchange received from Class 2 roads and switching and terminal companies. The interchange report contains date, time, place and the two railroads involved in the interchange, and a car record for each car involved in the movement. A summary record will follow, indicating a count of the cars covered by the interchange report.

The national railroad data center portion of TRAIN, the computer complex, will process this information daily. Any corrections will be requested via the WATS lines and roads will transmit these corrections when polled by the computer. Correction and inquiry messages will be handled separately from the interchange reports. This interchange information will be posted daily to a Car Location Master File, which will contain a record for each of the approximately 2.1 million Mexican, Canadian and U.S. freight cars recorded in UMLER (Universal Machine Language Equipment Register). Each record will contain data covering the latest four interchanges of the car. The file will be augmented by a history file, reflecting all movements of the car during a given month.

● **TRAIN reports available.** Three basic car service reports prepared by the TRAIN system are: (1) CS-8A, a weekly summary of car locations by railroad and type of car. This is a compilation of the present CS-11 reports from all Class 1 roads. (2) CS-10, a monthly summary of foreign cars on line by car ownership and type of car. Each Class 1 road will receive a CS-10 report only for cars on its own line. (3) CS-10A, a monthly summary by car type of the location road for each Class 1 road's car ownership.

TRAIN will report back to railroads, either on a request basis or on a regular schedule:

—To notify the car-owning road of equipment interchange between foreign lines to ultimately eliminate the junction slip procedure and for resolution of open per-diem records.

—To advise on request of the car-owning roads as to the location of their

Computer is the key to speedy TRAIN operation

TRAIN communications and data-processing requirements will be handled by an IBM 360 Model 40 computer with a 256 K core-memory central processing unit and two 2701 data-transmission control units capable of handling data sent from railroads at speeds ranging from 100 words per minute teletypewriter to 1,500 words per minute from a punched-card transmission device.

Peripheral equipment includes an 1,100-line-per-minute printer, a card reader punch with 1,000-cards-per-minute reading and 300-cards-per-minute punching capability, a 600-cards-per-minute auxiliary card reader and the 1052 typewriter console. These so-called low-speed input/output devices and the data-transmission control units are connected to the multiplexor channel.

Connected to the two selector channels are the highspeed I/O devices. These include three 2311 disk drives (7.25 million positions); a 2314 mass storage device, having a capacity of 233 million bits of information which will hold the master car-location file; and six 60KB magnetic tape drives. Initially, there will be no back-up system.

At least four cathode ray tube (CRT) display terminals will be provided for the Car Service Division—one each for the chairman, manager of closed cars and manager of open top cars and one for joint use of the managers' assistants. Probably another CRT display terminal will be provided for the Management Systems Department. These CRT terminals will be able to access the computer to obtain car-location information (that is, interchange information).

cars on foreign lines by type of car, by series of car numbers, by individual cars and by category of special equipment.

—To respond to inquiries by car-owning roads on location and/or utilization of cars assigned to pools.

—To provide inventory of cars, system and foreign on-line in summary form and inventory of system cars off-line by location and times by car types and by foreign ownership.

—To provide TRAIN reports affecting individual roads including present and future car-service reports and gateway flow statistics.

● **Disclosure is limited.** "Disclosure of information on railroad interchange of freight cars will be limited to authorized personnel of the AAR and to others only on the basis of proprietary and respective interests under its guidelines of (1) car-owning roads, and (2) roads originating loads," says AAR's Curry. Because TRAIN is a secondary source based upon railroads' primary sources, it is felt that it will not be of enough significant assistance to shippers in car locations to warrant their being provided access to the data. Their interest is more than a road-by-road location, says Curry. Consequently, there is no provision in implementation of TRAIN for access to information by shippers.

● **Updating will be daily.** During the day, the TRAIN computer will be dialing around, picking up information from the railroads. Anticipated loadings of the three outward WATS lines indicate the dial-up intervals to each railroad will range from 15 minutes to an hour.

On a once-daily basis, probably about midnight or 1 a.m., the system will take the received data and set up for immediate processing. "The data will go through several very extensive edits," reports Mitchell A. Morris, director, systems development division, management systems department. "Interchange reports which do not pass the edit and all cars relating thereto will be put into a suspense file and a message will be prepared for subsequent transmission to the sending railroads. Those interchange reports and car records which were satisfactory are passed on to the update program. During this update process, we perform further edits to be sure that we have no records for the cars referenced and that movements are logical with the moves previously reported on the cars. Any items found violating the edit rules during the update are combined with the items found during the preliminary edits and prepared for transmission back to the field."

A master file record will contain space for the last four interchanges per car. This will be supplemented, says Morris, by a back-up file to keep all moves on any given car for any given month. During the updating cycle, a variety of input data quality statistics will be developed for use in monitoring the TRAIN system. These may well alert Morris and his staff in time to prevent major problems from occurring.

● **TRAIN is coming.** After preliminary contacts with some railroads, TRAIN personnel and a representative of the Car Service Division will call on

How TRAIN's costs will be shared by participating railroads

Economic studies were made to determine the types of data-communications terminals that could be used in the TRAIN system to handle the varying volumes of data with reasonable costs. Four types of data terminals are planned for TRAIN and for use by roads participating in the TRAIN project. Low-volume roads, those delivering less than 1,000 cars per day in interchange, can select either Teletype ASR 33 or IBM 1050 units. High-volume roads, over 1,000 cars daily, can choose either AT&T's Data Speed 5 or the IBM 2780.

Interestingly, studies of reporting transmission volumes indicated that while 24 railroads reported 1,000 cars or less daily in interchange, 19 roads reported over 3,000 cars daily. These 19 high-volume roads transmitted over 330,000 words daily, while the 24 low-volume roads transmitted only 29,000 words daily. Studying the volume of transmissions by the day and time of day, it was found that Friday would peak to 10% over the daily average, and that on a daily basis, the day's traffic volume peaked at about 10 a.m. Eastern time.

For communications to railroads' data-processing headquarters, the TRAIN system will use outward WATS, Zones 2, 3 and 6. Line loading is anticipated to be 30 hours total, which should mean about 10 hours on each line per day. The TRAIN computer will dial out to all roads on a sequential basis, continuously, 24 hours daily, seven days per week.

Teletype ASR 33 or the heavy-duty ASR 35 have typewriter keyboards with printed and punched paper tape outputs. The ASR 33 uses the American Standard Code for Information Interchange (ASCII) and has no error detection. It has a rated speed of 100 words per minute. Cost is about $100 per month for the ASR 33.

The IBM 1050 terminal transmits from punched cards or punched paper tape at a speed of about 150 words per minute. Error-checking and automatic retransmission are provided. Printed output is an optional feature. IBM 1050 costs vary according to the options selected but can run as much as $350 per month.

AT&T's Data Speed 5 is a punched paper tape device which uses ASCII, 5-level or 6-level code for transmission. Rated speed is about 750 words per minute. It has no error-checking nor printed-output capability. Data Speed 5 rents for about $250 per month.

The IBM 2780 is a card terminal permitting the choice of transmission codes such as ASCII or a six-bit transcode. Rated speed is about 1,500 words per minute or about 75 cards per minute, but actual transmission speed is dependent on the card blocking factor (how much data on a card and where located). Printed copy and punched-card output are optional features.

The 2780 has error-checking and automatic retransmission. Rental charges range from $750 to $1,300 monthly depending on options.

The TRAIN project computer center will have one each of these transmission devices for back-up and testing purposes.

The original AAR study group for the TRAIN project recommended that "The AAR should pay the cost of transmission lines, rental on paper tape transmitters on railroad property and the costs of the data center [in Washington] with all costs to be apportioned to roads under the present formula," reports R. R. Manion, vice-president, Operations and Maintenance Department, AAR. Since this original recommendation, it has been decided that the individual roads will pay the equipment costs of receiving equipment, over and above the cost of the paper-tape transmitters.

all railroads by July 1, to obtain the best possible cooperation between roads and the TRAIN project. Richard E. Shelgren, director, information processing division, management systems department, AAR, explained it this way at a recent Data Systems Division meeting:

"Although there are many benefits which the railroads can derive from TRAIN, our primary customer will be the Car Service Division. We ask that your transportation people participate in our contact meetings to insure that they are aware of TRAIN objectives and thus will have confidence in TRAIN output and will be willing to accept CSD directives which will be based on TRAIN data.

"Our liaison with the railroad will determine the type of device [communications terminal] to be ordered, distribution of formats, procedures and the necessary operational manuals. Training arrangements will be made. The importance of the railroads' part in the collection and preparation of accurate and timely data must be emphasized. Thus the individual railroads have a commitment to TRAIN.

"The collection and formatting of interchange data will require a systems design and programming effort on most roads. Of course, this must be completed if we hope to make the January 1, 1970 date.

"Additional subjects for discussion at these contact meetings include determination of the road's TRAIN representative, development of the interchange point table, transmission of Car Service reports, and, where necessary, improved UMLER reporting," Shelgren says. Also, he emphasizes that roads must follow the proper formats for transmission of data. Experience with per diem and UMLER indicate that for the TRAIN system, all must understand the formatting rules and make sure that the rules are followed. "We are aware that proper training is going to play an important part in the success of TRAIN and are planning to furnish the necessary help in this area," Shelgren says.

It will be a busy 1969 for railroad systems, communications and data-processing personnel, considering that TRAIN is to be operational by Jan. 1, 1970. In brief, here's what has to be done to make TRAIN operational on that January day, only about 9 months from now.

—Contact roads.
—Select communications terminals.
—Distribute formats and procedures.
—Conduct training.
—Maintain liaison with railroad transportation and data systems people.
—Accept data.
—Analyze data. ■

LUTHER MILLER

AS THE EDITOR SEES IT

A PROPHET HONORED—Not every company president is a hero in his own boardroom. An exception is John W. Barriger. JWB's directors at the Katy clearly think he's the greatest thing to hit the rails since the steel wheel, and they have taken the unusual step of adopting a formal resolution to say so.

KNOWLEDGE PLUS DEDICATION—The Katy board's resolution, which is now being "suitably embossed" for presentation to the honoree, is no vaguely-worded, pro forma document. It is quite specific: "Through his vast knowledge in all phases of railroad operations, and through his dedicated and unceasing efforts, John W. Barriger has completely changed the company's position from one of declining traffic and income, poor service and mounting maintenance, accompanied by expensive derailments, increasing claims and shipper dissatisfaction, to a position of vastly improved freight car and locomotive ownership, service and shipper attitudes. . . ."

'MAN OF THE HOUR'—Katy's extraordinary thank-you note to the chief concludes: "This board, acting in behalf of all stockholders and officers of the company, as well as in its own behalf, duly acclaims John W. Barriger as Man of the Hour as well as Man of the Year for his unstinted efforts in restoring the Missouri-Kansas-Texas Railroad Company to a position of high honor . . . ."

HE KNOWS, AND HE SAYS—It was four years and four months ago that Railway Age paid its own tribute to John W. Barriger on the occasion of his retirement as president of the Pittsburgh & Lake Erie (a tribute which has had to be updated periodically because JWB, like the steel wheel, has been slow to wear out). In a cover story at that time, editor Jim Lyne described JWB, with the irreverence permissible among old friends, as "a blend of P. T. Barnum and a data-processing machine" whose career had been an unremitting refutation of the old Chinese adage: "Those who know don't say; those who say don't know." John Barriger does know what railroading is all about—and for all who will listen, he tells it, often and eloquently.

WE SECOND THE MOTION—There are 76 Class I railroad presidents. Not all of them can communicate the excitement and the still unrealized potential of railroading as vividly and as credibly as John W. Barriger. As we heartily second the motion of the Katy board, it is with the hope that the spirit of JWB can become the spirit of 76.

LETTERS

"Chaotic" freight service

Westbrook, Maine

To the Editor:

Robert G. Lewis's article in the February 17 issue of *Railway Age* (page 35) entitled "To Create a Customer" was the best critique on railroad problems that I have ever read. An absolute gem!

If only every railroad president would read and digest that article perhaps they would get the message.

After sixteen years in industrial traffic, I can honestly say that I have never seen "end to end" service as chaotic as in the past six months.

Small wonder that their Ex Parte increases are so bitterly opposed. Why pay more freight charges for a continual deterioration in service? I doubt if industry would or could vigorously oppose increases (particularly in smaller and more frequent steps) *provided* there already existed a gradual improvement in service. Over the years we have increased the price of our papers—however, the customer is getting a far superior sheet of paper than he was ten years ago. Not so with railroad service.

P.S.Q. (preserving status quo) in anything, slowly, surely, spells D-E-A-T-H. Servicewise, not only has it failed to progress, the railroad industry has failed miserably in even "P.S.Q." over the years.

When, oh when, will management give the operating department authority to move traffic rather than hold for longer trains which, while improving ton miles per train hour, is most certainly resulting in a continued diversion of traffic?

As Mr. Drucker stated, "A business has one valid definition of purpose—to create a customer."

Perhaps this definition should be stretched to read "not destroy him."

Edward S. Crawford
Assistant Traffic Manager
S. D. Warren Company

Year	Average Cost of New Cars		Average Tonnage Capacity of New Cars	Average Cost per Ton of Capacity	
	Amount	Index		Amount	Index
1957	$ 8688	100.0	61.9	$140.36	100.0
1958	9151	105.3	61.9	147.84	105.3
1959	10380	119.5	62.7	165.55	117.9
1960	11115	127.9	64.8	171.53	122.2
1961	11392	131.1	69.4	164.15	116.9
1962	11793	135.7	71.4	165.17	117.7
1963	14111	162.4	73.4	192.25	137.0
1964	14085	162.1	75.4	186.80	133.1
1965	15466	178.0	78.2	197.77	140.9
1966	15337	176.5	77.1	198.92	141.7
1967	14100	162.3	80.0	176.25	125.6
Average Increase	6.2%		2.9%	2.6%	

Freight car prices

To the Editor:

We read the fine article in the Jan. 20, 1969, issue of *Railway Age*, "Equipment Spending to Rise Sharply," as part of the section on the 1969 Outlook.

Much interest has been focused on the subject of equipment costs, and certainly one of the foremost tasks in planning is to analyze changing price conditions.

As your article showed, the average cost of new cars installed has risen significantly in the past ten years. However, it is important to note that car sizes have risen sharply in this period as well. An analysis of this situation reveals that the average cost of new cars has increased 62% over the past ten years, but the cost per ton of carrying capacity has increased only 26% (see table above).

We believe the cost-per-ton figure to be more indicative of freight car prices, because railroads purchase cars with the objective of satisfying capacity requirements in tonnage, not cars.

James E. Cathcart
Manager Planning & Development
Pullman-Standard

Passenger service

Longview, Wash.

To the Editor:

The over-all record of the privately-owned railroads in providing good passenger service is rather poor despite the efforts of a handful of railroads such as the Northern Pacific, the Santa Fe, the Illinois Central, the Great Northern, the C&O/B&O, the Seaboard Coast Line and to a certain extent, the Penn Central.

Nor is it necessary to go outside of the industry to find abundant and well-reasoned criticism. For instance, E. H. Hungerford, a vice president of the New York Central, went through quite a list of shortcomings in his 1920 book "Our Railroads Tomorrow."

About three years ago the British Railways electrified their London-Manchester line. New rolling stock was bought and the track and signals improved. More trains were added.

Limited trains are scheduled to cover the 188 miles in one and one-half hours. In only three years revenue passengers have increased more than 73%.

There are indications that similar service in the United States would attract many passengers. But such an intelligent use of rail facilities most likely awaits the end of capitalism and the advent of Socialism.

Henry R. Korman

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I. Walton King
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William M. Moloney
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P. H. Mathews
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I. Sewell Morris
AAR

Edward A. Kaier
PC

David E. Smucker
PC

PEOPLE IN THE NEWS

ASSOCIATION OF AMERICAN RAILROADS.—I. Walton King, staff assistant for planning and procedures, **Louisville & Nashville,** Louisville, Ky., appointed vice chairman, Car Service Division, AAR, Washington, D.C. **Herman P. Kappel,** assistant to chairman—refrigerator cars and assistant district manager, Chicago, named district manager there, succeeding **Gordon G. Schwinn,** who retired Feb. 28. **H. Donald Summers,** assistant district manager, St. Louis, promoted to district manager, Minneapolis, succeeding **William C. Anderson,** who retired Feb. 28. **H. R. Heffernan,** secretary, Great Lakes Region Rail Shippers Advisory Board, Detroit, named assistant to manager, Open Car Section, Washington, succeeding **D. C. Keller,** named assistant district manager, Chicago. **J. F. Bishop,** assistant to director, Military Transportation Section, Falls Church, Va., appointed assistant to manager, Closed Car Section, Washington, succeeding **D. D. Shepherd,** named assistant district manager, St. Louis. **H. G. Sumrall,** car service agent, Houston, succeeds Mr. Bishop at Falls Church.

William M. Moloney, who heads the AAR Law Department as general counsel, promoted to vice president. **P. H. Mathews,** assistant vice president, named vice president in charge of the Legislative Department. **I. Sewell Morris,** assistant vice president, promoted to vice president. General Morris has been serving in various cooperative assignments involving government and private agencies engaged in defense activities affecting the railroad industry.

Carl V. Lyon, assistant general solicitor, appointed general attorney. **Hollis G. Duensing,** attorney, promoted to assistant general attorney.

J. Paull Marshall, J. Donald Parel, Lyle O. Snader and **William B. Thompson, Jr.,** assistants to the vice president, promoted to assistant vice presidents, Legislative Department.

PENN CENTRAL.—John B. Prizer, vice president and general counsel, Philadelphia, will retire May 1 for reasons of health. **Edward A. Kaier,** senior general solicitor, succeeded Mr. Prizer as general counsel on Feb. 1 and Mr. Prizer will

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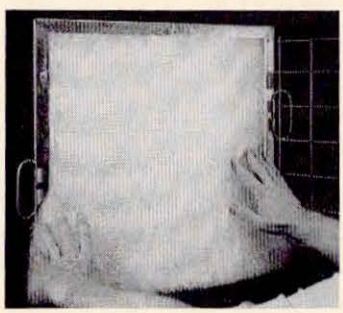

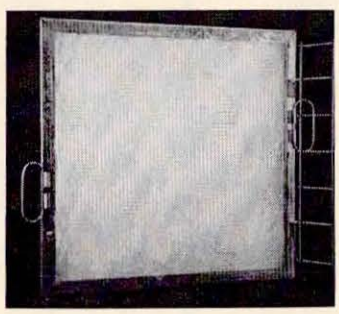

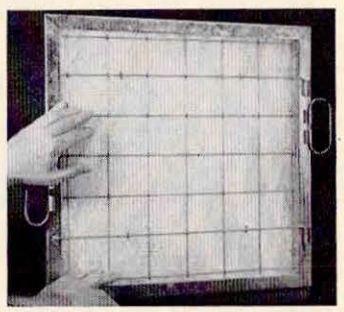

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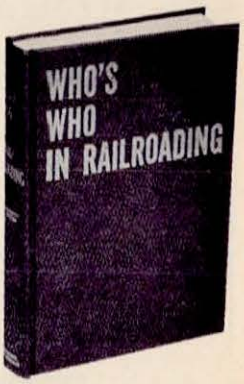

- His present title or position
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continue as vice president–law until May 1.

David E. Smucker, executive vice president, reassigned to the staff of the board chairman and will serve as executive vice president of the parent holding company when it becomes effective. **Robert G. Flannery,** vice president–systems development, named vice president–operation. **James A. McDonald,** vice president–production, **Canadian National,** Montreal, appointed vice president–executive assistant to president, PC, a newly created position.

Charles H. Wolfinger, vice president–traffic, **Lehigh Valley,** appointed assistant vice president–coal and ore sales, PC (RA, March 3, p. 37).

Paul D. Fox, vice president, financial department, retired March 1, after 39 years of service. **Christy G. Magruder,** assistant vice president, traffic administration, retired Jan. 31, after 45 years of service.

Thomas B. Graves, Jr., director–market planning, appointed assistant vice president–market planning and research, **Joseph M. Ostrow,** assistant vice president–market planning and research, named assistant vice president–business systems and information services, succeeding **Carl G. Sempier,** resigned.

Francis J. Gasparini, director–real estate, system, advanced to assistant vice president–real estate.

W. Llewellyn Millar, manager–passenger sales, Philadelphia, appointed director–passenger sales. **Charles A. Dawson,** regional passenger agent, Western Region, Chicago, succeeds Mr. Millar at Philadelphia. **David S. Keim,** manager-passenger sales—staff, Philadelphia, appointed manager, special movement bureau, which will be consolidated into a single system office in Philadelphia.

E. Robert Adams, general superintendent–transportation, Eastern Region, Philadelphia, appointed assistant general manager there, succeeding **Frank S. King,** promoted to general manager, Northeastern Region, Syracuse, N.Y. Mr. King succeeds **R. C. Harrison,** transferred to the Southern Region at Indianapolis, Ind., to replace **Jeremy Taylor** (RA, Feb. 10, p. 28.) **J. Grant Robins,** superintendent, New Jersey Division, appointed general superintendent – transportation, succeeding Mr. Adams. **Robert A. Rutledge,** assistant superintendent–transportation, Central Region, Pittsburgh, named division superintendent, Pittsburgh Di-

(Continued on page 51)

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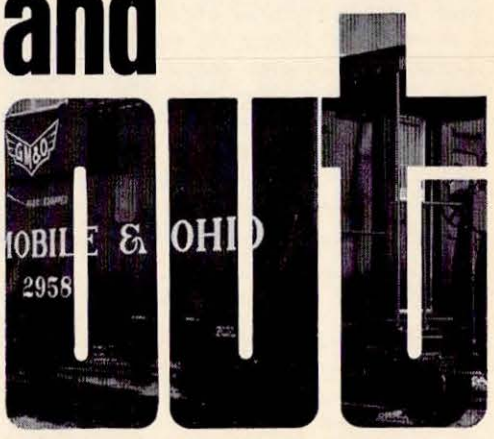

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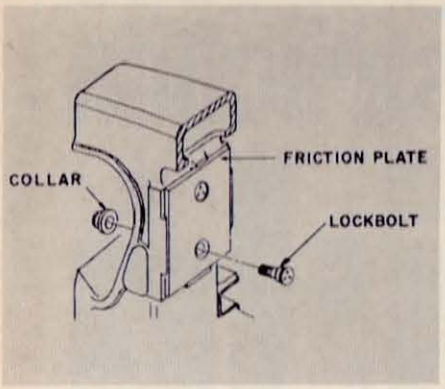
NEW PRODUCTS REPORT



Friction plate (RA-1)

A new method of attaching friction plates to side frames using lockbolts rather than welding is being offered as standard for the Ride Control truck. This method of application is claimed to decrease maintenance costs while increasing trouble-free mileage. In place of the 2-inch welds at each corner of the friction plate, testing has indicated that a pair of lockbolts spaced 5¼ inches apart are faster and easier to apply and remove, while assuring a snug fit. *American Steel Foundries.*

Video tape recording (RA-2)

A battery-operated video tape recording system uses a closed-circuit TV camera only slightly larger than a home movie camera. The system is completely portable with a ½-inch tape unit that records both sight and sound. Instant playback can be provided on any GE ½-inch VTR recorder deck. The hand-held TV camera weighs less than 5 pounds and has a small removable microphone mounted on top to record voices or background sounds. A one-inch viewfinder serves as a small TV screen to show the cameraman the action being recorded. The camera has a zoom lens.

The video tape recorder is carried over the shoulder and is linked to the camera by a single cable. The recorder unit weighs about 10 pounds, complete with two rechargeable batteries. Operating speed of the ½-inch tape is 7.5 inches per second with 20 minutes recording on each 5-inch reel. Two rechargeable batteries permit about one hour of recording time. Over-all weight of the complete GE Porta-Pack system is less than 15 pounds. *CCTV Business Section, General Electric Co.*

Data terminal (RA-3)

The DCT 2000 data communication terminal is a reader/punch and printer with associated control unit and operator's console. The reader/punch is rated at 200 cards per minute for reading and 75 cards/per minute for punching. The printer is rated at 250 lines per minute. The DCT 2000 transmits synchronous data, block by block, at 2,000 or 2,400 bits per second under half duplex operation using ASCII code, format and procedure. The DCT 200 is compatible with the EIA RS-232B standard communication interface. To send data and receive a reply, contact is made with the operator at the central site by direct voice communication, or the computer sends a tone to the operator. The telephone set is then put on the "data" position and the "clear" and "transmit" buttons on the console are depressed. In a typical situation, the reader will read cards until the card input-hopper is empty. The "out-of-cards" indicator designates that the card reader is finished transmitting, and the control unit will revert to the receive state and prepare to accept data. *Univac.*

NEW LITERATURE

STEEL PRODUCTS. Baldwin-Lima-Hamilton Corp.'s Standard Steel Division has issued a 20-page color brochure describing its current capabilities and facilities as a major supplier of products forged from high-quality alloy, maraging and stainless steels, specialty steels, non-ferrous metals and super-alloys. The brochure relates metallurgical and production skills to such basic product lines as railroad wheels and axles. (NL-1)

PACKAGING. The "hows," "whys" and "whens" of engineered packaging are presented in a new Engineered Packaging Idea File bulletin from Lord Manufacturing Co. Bulk cushioning and structural cushioning are the two major methods treated. (NL-2)

RAIL FASTENERS. A new catalog of rail fasteners has been issued by Woodings-Verona Tool Works. It describes in detail the Woodings advanced type Rail Anchor with the four-point spring-action grip which gives the anchor its exceptional holding power. Methods of installing Woodings Rail Anchors, by hand or machine, are illustrated. (NL-3)

FORK LIFT SAFETY HINTS. A new 32-page illustrated booklet called "Operating Safety Hints" is available for fork lift truck users from Otis Material Handling. The booklet covers such basic points as proper loading, speed limits, safe starting and stopping, alertness, floors and surfaces, "rules of the road," and truck operating hints. (NL-4)

DOCK DESIGN. Kelley Co.'s new, enlarged "Modern Dock Design" brochure examines the problems and offers solutions to the design and equipping of all loading docks, including those on rail sidings. (NL-5)

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3/17-24/69

Henry G. Allyn, Jr.
P&LE

John D. Taylor
SCL

(Continued from page 49)
vision, succeeding **Hugh J. Martin,** named general superintendent — transportation, Southern Region, Indianapolis. **Charles W. Bolyard,** regional supervisor—car utilization, Pittsburgh, succeeds Mr. Rutledge. **James B. Pollum,** supervisor—special equipment, Pittsburgh, succeeds Mr. Bolyard. **John B. Hitchcock,** division superintendent, Weehawken, N.J., transferred to the Hudson Division, New York. **Paul A. DiGangi,** division superintendent, Ft. Wayne, Ind., transferred to the New Jersey Division at New York, **Mario R. Infante,** yardmaster, Waverly Yard, N.J., appointed trainmaster, Hudson Division, Yonkers, N.Y.

S. B. Dixon, assistant superintendent motive power, Altoona, named assistant superintendent, Allegheny Division, succeeding **R. M. Decker,** named director operating practices, Philadelphia. **G. H. Cump,** assistant trainmaster, Trenton, N.J., succeeds Mr. Dixon as assistant superintendent motive power at Altoona. **D. J. Christ,** trainmaster, Conway, Pa., transferred to Altoona, to succeed **R. W. Coover,** promoted to terminal superintendent, Charleston, W. Va.

Robert W. Blanchette appointed general attorney—New England, at New Haven. The territory includes that served by the former New Haven, of which Mr. Blanchette was general counsel, and the New England segment, Boston to Albany line of the PC.

William M. McCracken, resident engineer, Baltimore, Md., named regional engineer—design and construction, succeeding **Glenn A. Williams,** retired after 41 years of railroad service. **Max K. Clark,** division engineer, Harrisburg Division, Harrisburg, Pa., named regional engineer—maintenance of way, Central Region, succeeding **Glenn E. Hartsoe,** named chief regional engineer, New Haven Region (Feb. 10, p. 28.)

Philip D. Ohl, manager of international freight services, New York, appointed director of market planning for the automotive, metals, machinery and chemical industries, and intermodal services. **Paul W. Olson,** manager of agriculture industry services, New York, named director of market planning for the construction, agricultural, paper and consumer goods, food, and waste materials industries, in addition to Flexi-Flo rail-highway distribution operations.

PITTSBURGH & LAKE ERIE.—Henry G. Allyn, Jr., assistant vice president—freight sales, **Penn Central,** New York, elected president, P&LE, Pittsburgh, succeeding **Curtis D. Buford,** who has been elected president, **Trailer Train Co.,** Philadelphia (RA, Jan. 27, p. 7.)

SEABOARD COAST LINE.—John D. Taylor, assistant general manager rates, promoted to general manager rates (RA, Feb. 24, p. 43).

OBITUARY

R. R. Johnston, 45, freight traffic manager, **British Columbia Hydro & Power Authority,** Vancouver, B.C., died Jan. 26 in Lions Gate Hospital.

W. F. Shields, purchasing agent, **Louisville & Nashville,** died Feb. 2.

Ernest W. Wright, 57, vice president, Trailer Service Department, **Chesapeake & Ohio—Baltimore & Ohio,** Baltimore, Md., died March 3, at Greater Baltimore Medical Center.

Francis H. Young, sales representative in the New York area for the **Transportation Division, The Adams & Westlake Co.,** died Feb. 20.

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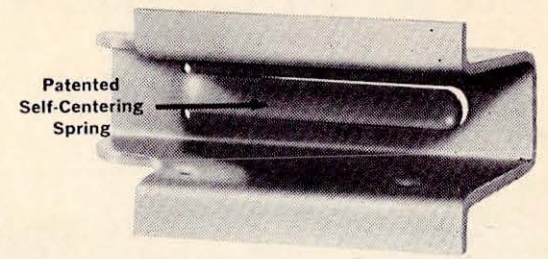

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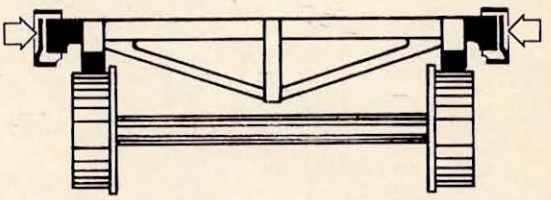

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Circle 23 on coupon page 50

Airlines worry about jumbo jets

(Continued from page 42)

airlines' problem seems monumental. "The problems the jumbo jet will introduce," he says, "will be horrendous —worse than anything they've ever seen."

• **The need for trucks.** Imperatore thinks airlines will have to become involved in the trucking business, one way or the other, leasing or purchasing substantial numbers of trucks to gain the leverage they need. "The advent of the jumbo jet will make the design of the truck important to the success of air cargo service," he contends. If that problem is worrisome to airline executives, Imperatore has another. He "would hesitate to recommend to an airline president that he get into private carriage, unless there was no other way to get the ground transportation needed."

A better solution, he says, would be an arrangement with a common carrier "which might operate with airlines on an expedited basis." The arrangement would be intricate. Schedules of airline and trucker would have to be coordinated perfectly—keeping a jumbo jet on the ground an extra hour a day would cost an airline $2 million a year in lost revenues—and to achieve coordination, air freight would have to be segregated from surface freight. While that may seem simple enough, surface carriers haven't yet fully solved the less-difficult problem of classifying surface freight.

The problem is not unsolvable. It will, in fact, have to be solved. "Air freight is not an alternative for getting goods to market," says Elwood Clary, assistant vice president-distribution, Emerson Electric. "It's too costly. And planes alone won't change this attitude."

• **New rate structure.** Clary's message is clear. Shippers, more and more, are concerned with total distribution costs, and less and less, with transportation costs. "The total cost approach," warns Clary, "must be emphasized." In addition to developing proper ground facilities, the airlines, says Clary, will have to develop a new rate structure. "The present structure," he points out, "was developed at a time when volume was small and piston planes were used."

Failure to meet the challenges posed by the jumbo jets could spark a surge in private carriage. It was apparent at the seminar that several major shippers may be looking at the jumbo jets with the pride of ownership. The cost, of course, would be high, but the glamour is great. "Private carriage by air is inevitable in the short run," claims Prof. Norton Marks of Notre Dame. Once carriers move into private carriage, they may stay. "When a shipper invests heavily in a fleet," says Marks, "he tends to see to it that private carriage works well. He has a psychic commitment. If the private fleet fails, a process of rationalization takes over. The man who made the decision says the private fleet wasn't the reason for the failure: He says the company's product cannot be shipped by air. From that point on, you can't sell him air transportation."

The rationalization process loses more than one shipper, Marks contends. "What Ford does doesn't go unnoticed by Chrysler. It's not long before an entire industry decides its products are not air capable."

• **Plane builders optimistic.** Aircraft manufacturers, while conceding that problems will attend the advent of the jumbo jets, prefer to take the optimistic view. They observe a distribution revolution taking place and as they see it, shippers are going to use the jumbo jets —the only question is how they will use them. ■

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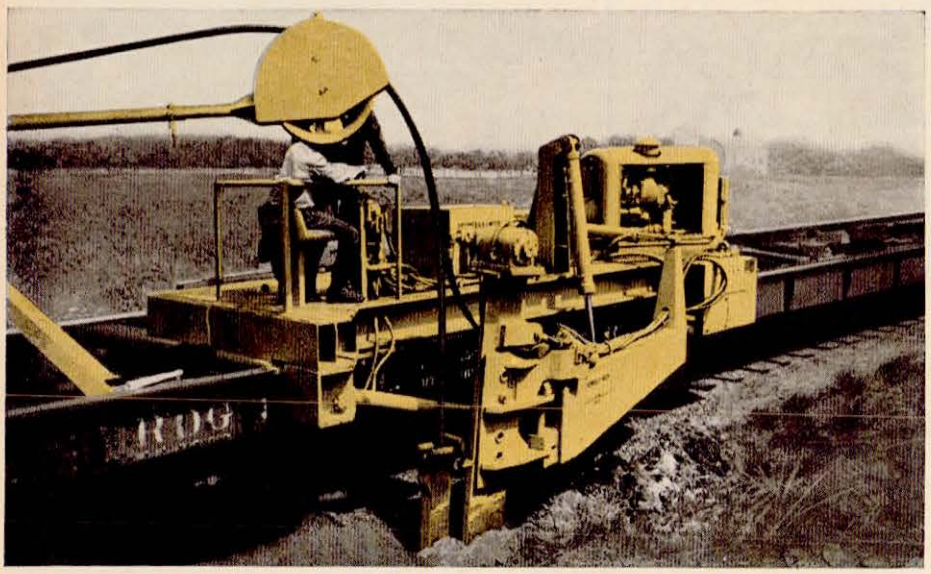

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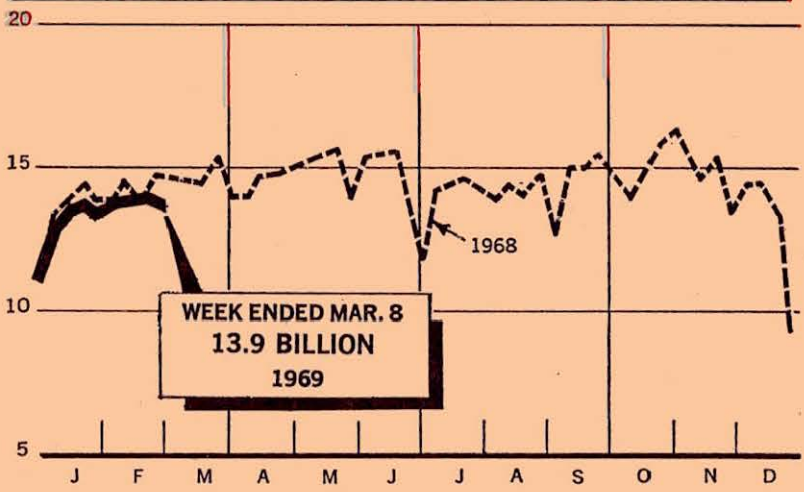
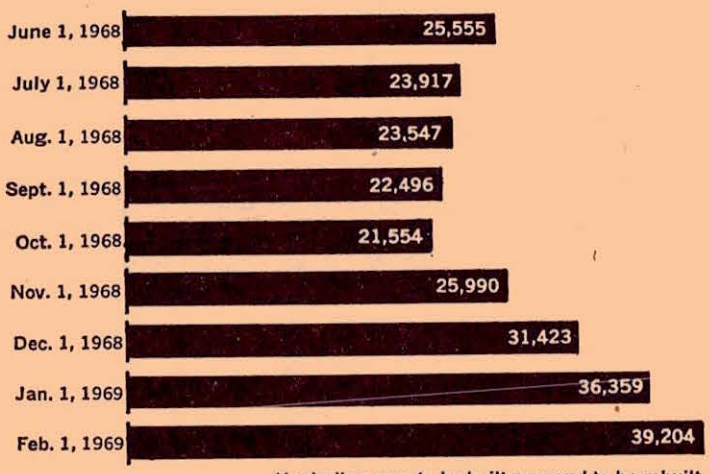


Source: Association of American Railroads

FREIGHT CARS ON ORDER AND UNDELIVERED*



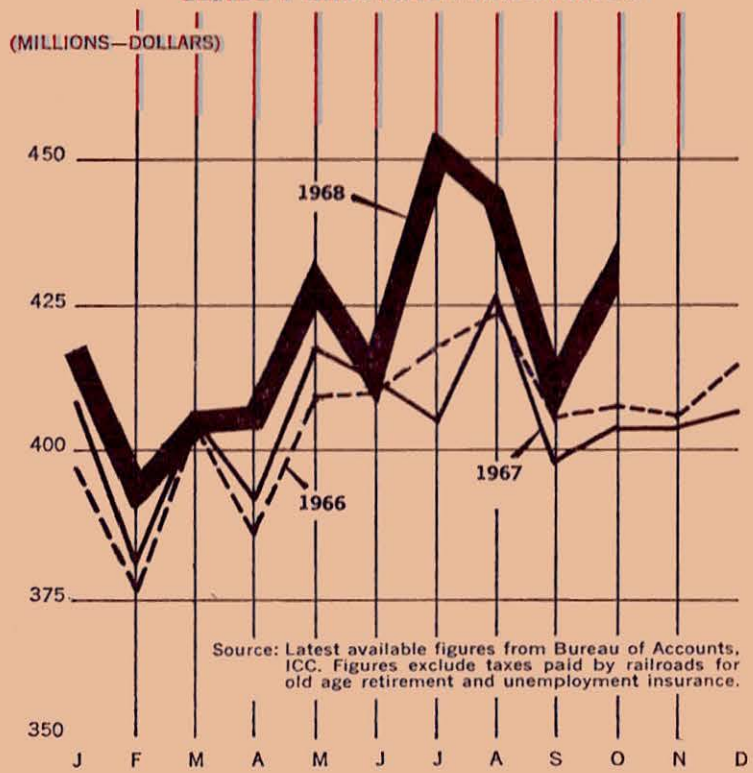
*Including cars to be built new and to be rebuilt.

Source: American Railway Car Institute and AAR.

Current Statistics

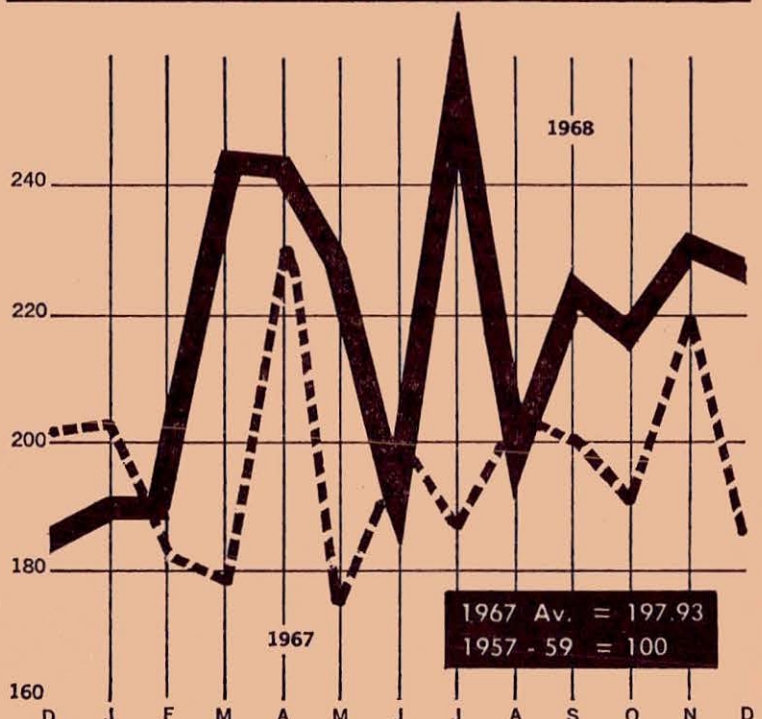
Net income, Class I roads	
Twelve months, 1968	$593,000,000
Twelve months, 1967	$551,000,000
New freight cars on order	
Feb. 1, 1969	34,989
Feb. 1, 1968	24,670
New Freight cars delivered	
1 mo., 1969	4,482
1 mo., 1968	4,717
Serviceable cars	
Feb. 1, 1969	1,379,938
Feb. 1, 1968	1,401,643

WAGE STATISTICS
CLASS I LINE-HAUL RAILROADS



Source: Latest available figures from Bureau of Accounts, ICC. Figures exclude taxes paid by railroads for old age retirement and unemployment insurance.

INDEX OF
MATERIAL HANDLING EQUIPMENT BOOKINGS



NOTE: Annual total dollar volume of $1,310,407,094 worth of new bookings for industrial material handling equipment was reported during 1968. The 1968 figure, an all-time high for the industry, exceeded the 1967 dollar volume by $134,000,000, or 11.42%.

Source: The Material Handling Institute.

MARKET OUTLOOK

CARLOADINGS

Loadings of revenue freight in the week ended March 15 totaled 523,210 cars, the Association of American Railroads announced on March 20. This was an increase of 22,682 cars, or 4.5%, compared with the previous week; a decrease of 4,530 cars, or 0.9%, compared with the corresponding week last year; and a decrease of 13,752 cars, or 2.6%, compared with the equivalent 1967 week. Ton-miles generated by carloadings in the week ended March 15 are estimated at 14.4 billion, the same as for the corresponding week of 1968, and 1.9% above the 1967 week.

REVENUE FREIGHT CARLOADINGS

Commodity	Mar. 8 week	Preceding week	Per cent change
Grain	20,561	20,830	— 1.3
Farm products	14,800	17,162	—13.8
Metallic ores	18,872	19,278	— 2.1
Coal	70,755	76,036	— 6.9
Crushed stone, gravel & sand	24,514	23,640	+ 3.7
Nonmetallic minerals	10,009	9,296	+ 7.7
Grain mill products	20,833	20,430	+ 2.0
Food & Kindred products	25,501	26,241	— 2.8
Primary forest products	24,413	26,793	— 8.9
Lumber & wood products (except furniture)	16,061	16,881	— 4.9
Pulp, paper & allied products	25,103	25,674	— 2.2
Chemical & allied products	33,624	32,480	+ 3.5
Petroleum products	12,212	12,398	— 1.5
Stone, clay & glass products	20,967	20,475	+ 2.4
Coke	7,222	8,164	—11.5
Metals & products	30,824	31,429	— 1.9
Motor vehicles & equipment	25,700	24,869	+ 3.3
Waste & scrap materials	15,615	15,454	+ 1.0
Forwarder & shipper assn. traffic	7,981	7,199	+10.9
All other carloads	72,921	74,827	— 2.5
LCL traffic	2,040	1,805	+13.0
Total cars loaded	500,528	511,361	— 2-1

CUMULATIVE TOTAL, TEN WEEKS	1969	1968	1967
	4,996,136	5,037,856	5,158,883

PIGGYBACK CARLOADINGS

U. S. piggyback loadings for the week ended March 8 totaled 27,382 cars, carrying 45,350 trailers, compared with 25,775 cars, carrying 42,017 trailers, in the corresponding 1968 week. Loadings for 1969 up to March 8 totaled 246,721 cars, carrying 404,221 trailers, compared with 237,818 cars, carrying 390,890 trailers, in the corresponding period of 1968.

IN CANADA

Cumulative totals	Revenue Cars Loaded	Total Cars Rec'd from Connections
Feb. 14, 1968	412,788	145,520
Feb. 14, 1969	429,157	147,061

FREIGHT-TRAIN CARS

● *Grand Trunk Western.*—Leased 431 box cars valued at about $9 million, from GECC Leasing Corp., subsidiary of General Electric Credit Corp. Thrall Car built 105 high-cube cars covered by the lease; Pullman-Standard and ACF built 326 60-ft. box cars making up the rest of the acquisition.

● *Missouri Pacific.*—Has ordered an additional 1,020 freight cars costing about $16,770,000 as part of its 1969 capital improvement program. Orders were placed as follows: ACF—200 100-ton box cars and 150 70-ton box cars; Pullman-Standard—200 100-ton covered hopper cars; MP De Soto shops—200 100-ton gondola cars; Ortner—100 100-ton covered gondolas; Thrall—50 100-ton steel coil cars with lift-off covers; Magor—20 50-cubic-yard-capacity air dump cars; Pacific Car & Foundry—100 70-ton insulated box cars. All the new box cars will have special cushioning and load-restraining devices.

● *Santa Fe.*—Ordered 2,489 new freight cars at a cost of about $42 million. Santa Fe will receive 650 open-top hopper cars from Greenville Steel Car; 400 mechanical temperature-control cars from Pacific Car & Foundry: 50 60-ft box cars equipped with lading-protection devices from Thrall Car; 50 hopper cars from Magor; and 14 hopper cars from Gunderson Brothers. Company shops at Topeka, Kans., will build 1,200 box cars; 55 100-ton ore cars; 50 gondolas; and 20 100-ton flat cars for coil-steel service.

● *Southern Pacific.*—Ordered 1,000 wide-door box cars from Gunderson Brothers at a cost of approximately $14 million. Gunderson is now completing work on an $18-million Southern Pacific/Cotton Belt order, placed late in 1968, for 1,000 wide-door cars and other freight-car equipment.

● *Trailer Train.*—Ordered 150 89-ft, 4-in. standard level cars from Bethlehem. TTX purchases of new cars since Jan. 1 now total 1,295. As of March 7, TTX had 49,861 cars in service or on order.

MAINTENANCE EXPENDITURES

● *Fourth Quarter of 1968 up 7.8% above fourth quarter of 1967.*—Expenditures by Class I roads for maintenance of equipment, way and structures in the fourth quarter of 1968 were up about $60.7 million, compared with the fourth quarter of 1967, according to report of AAR Economics & Finance Department, summarized below.

	Fourth Quarter 1968	1967	% Change
Maintenance of way and structures	$360,149,710	$318,983,575	+12.9
Maintenance of equipment	482,693,105	463,140,609	+ 4.2
Totals	842,842,815	782,124,184	+ 7.8

YOU OUGHT TO KNOW

More journal box attention aims to cut hotboxes

The industry's deteriorating performance from plain journal bearings has caused the AAR Mechanical Division to take steps to cut the mandatory servicing interval for unstabilized and unsealed journal boxes from 30 to 24 months. After years of steady reductions, the incidence of hotboxes increased almost without let up during 1968. According to W. H. Chidley, Mechanical Division executive vice chairman, the record has been particularly bad this winter. He points to the failure of many roads to service boxes at "reasonable" intervals and to the tendency to allow deteriorated lubricating devices to continue in service. While Mechanical Division committees are taking steps to require more frequent attention for unsealed and unstabilized boxes, Chidley is urging railroads and private car owners to initiate these steps voluntarily and immediately. It was in 1961 that the Division extended the mandatory interval from 24 to 30 months.

Highest rated single-engine diesel for CP

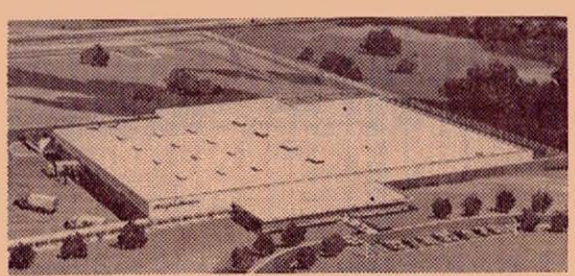
North America's most powerful single engine diesel locomotive will be delivered by MLW-Worthington to Canadian Pacific early next year. The six-motor, 16-cylinder locomotive, one of an order of 30 units for CP Rail's fast freight service (RA, March 10, p. 45), will be arranged experimentally for an output of 4,000 hp, compared with the 3,600-hp ratings of the other units in that order. The Alco-designed engine thus becomes the first to be pushed to this new high in output. Electro-Motive currently rates its 20-cylinder engine at 3,600 hp; General Electric sets the top at 3,300 hp for its 16-cylinder diesel engine.

Kansas Senator advocates intermodalism

U.S. Senator James R. Pearson (R.-Kan.) believes that "the questions of intermodal coordination will be the most important transportation issues before the Congress during the next five years." He told the Air Freight Motor Carriers Conference in Washington: "Transportation systems, whether package or passenger, must be ready to provide transport from the doorstep of departure to the doorstep of destination, efficiently handling all the connections in between." He called for "a relaxation of regulatory statutes, sometimes interpreted so strictly that they prohibit different modes of transportation from even getting together to discuss major questions of mutual concern."

House transport subcommittee shows no change

The House Interstate and Foreign Commerce Committee has named members to its subcommittees, and for the 91st Congress the men on the transportation subcommittee are the same as before: Samuel N. Friedel (D.-Md.), chairman, John D. Dingell (D.-Mich.), J. J. Pickle (D.-Texas), Daniel J. Ronan (D.-Ill.), Brock Adams (D.-Wash.), Samuel L. Devine (R.-Ohio), Glenn Cunningham (R.-Nebr.), Albert W. Watson (R.-S.C.), and Dan Kuykendall (R.-Tenn.).



FreightMaster building new $3-million plant

FreightMaster, a division of Halliburton Services, has started construction of a new $3.3-million plant for the manufacture of its hydraulic car cushioning devices. When the new facility in suburban Carter Industrial Park is completed late this year, operations will be transferred from the present downtown Fort Worth, Tex., plant. Employment is then expected to rise from the present 500 to 700 as production is expanded.

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VIEWPOINT

Safety problems need a rational approach

If there's one thing that isn't needed, in helping to solve railroad safety problems, it's irrationality.

If there's one thing that *is* needed, it's a reasoned approach, free from panic and free from the influence of those whose stock solution to any problem is to plaster it over with legislation.

It's hard to believe that anyone could be more concerned than a railroad man when safety is at stake. Safety, the rule book says, "is of the first importance in the discharge of duty." Railroad managers live by that rule, just as the switchman or engineer must. He who breaks the rule—on whatever level—suffers the consequences, sooner or later.

Still, railroads and their managers are under suspicion and under attack. There has been an increase in derailments. There has been a series of tragic incidents involving hazardous cargo. Industry critics have leaped into action, demanding that "something be done." Inevitably, "something" involves new law—and regulation-making. Inevitably, the industry's image will take a beating, at a time when new image-problems are least needed. And at this point, there's no guarantee that *any* legislative or regulatory proposal will really do the job of making railroads safer.

To put it another way, the industry doesn't need hastily-contrived solutions. Especially, it doesn't need hastily-contrived solutions to a problem which has not been adequate identified.

What *is* needed? Information—more information and better information, of the kind that can come from improved industry-based analysis and, perhaps, only from there.

This is the kind of information that doesn't come easily. Determining the cause of a derailment is essentially a matter of hindsight. Sometimes it's simple to pinpoint a cause. Sometimes it's as complex a job as that faced by air-crash investigators trying to piece together wreckage that may have scattered over many square miles.

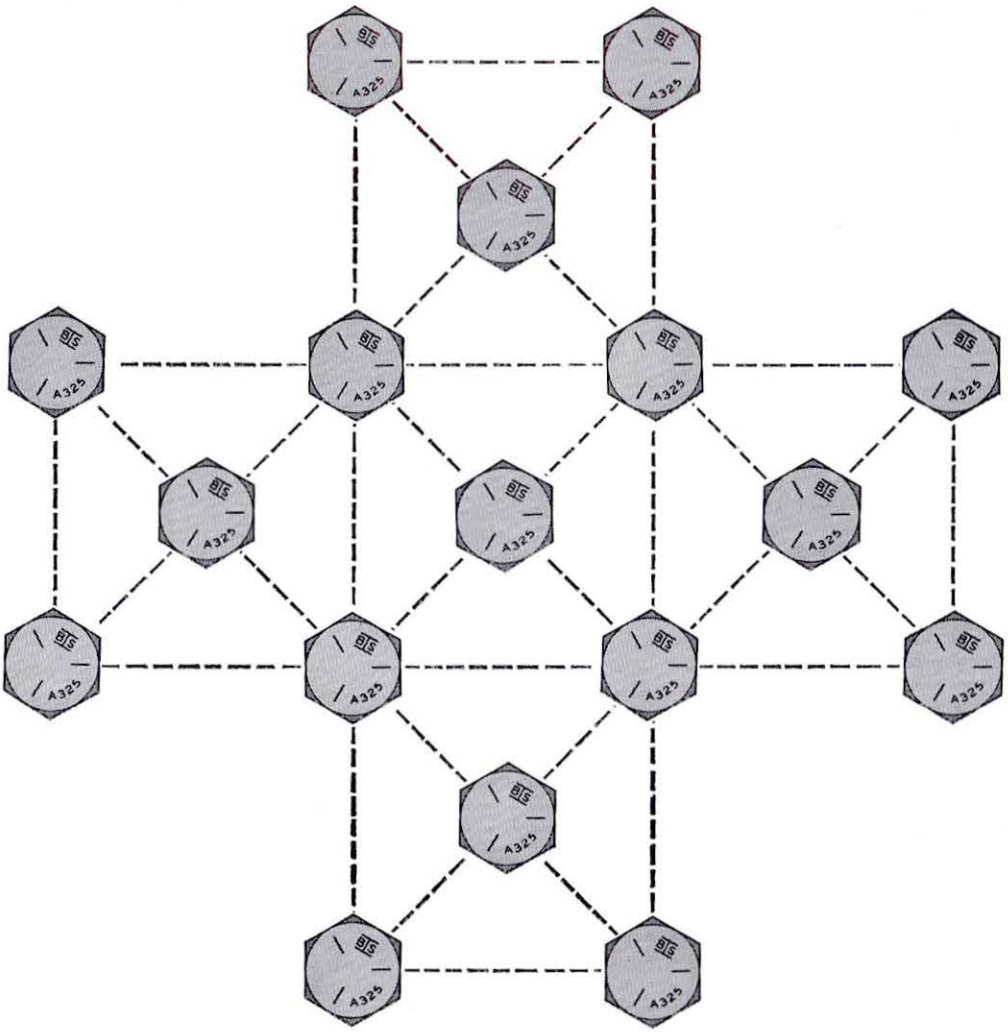
Sometimes even an exhaustive investigation ends up in a puzzle. "We think it was a rail failure," says the Mechanical Department. "We think it was equipment failure," says the Engineering Department. "Well, it sure wasn't man-failure, and don't you claim it was," says the brotherhood.

TWO KEYS TO IMPROVEMENT

In the railroad's own investigation, however, lies one of the keys to safety improvement. In greater research—cooperative research involving railroads, suppliers, perhaps the AAR and the FRA—lies another key.

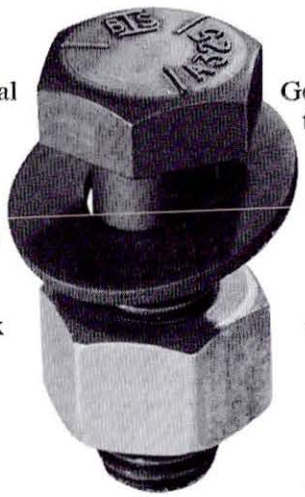
Politically, it may be popular to cut loose with oratory, and to dish out verbal wallops against the industry and its record. Politically, it may be less than popular to counsel patience, and to line up in favor of the rational investigative approach.

Politically, the line of least resistance may be to fill the legislative hopper and crank up the publicity mill. But the line of least resistance could easily also be the line of least accomplishment. And neither the industry nor the nation will benefit if politics is allowed to triumph over rationality.



Can you solve the Bethlehem bolt puzzle?

Here are seventeen high-strength structural bolts. To complete the puzzle, the bolts are to be connected by vertical, horizontal, or diagonal lines . . . as shown above by dashes . . . *with as few lifts of the pencil from the paper as possible.* Lines may cross at, or extend beyond, bolt heads . . . but backtracking over a line is not permitted. Nearly everyone can solve the puzzle in six continuous moves of the pencil. The trick is to do it in five or less. Can you?



Genuine puzzles in your production line are anything but fun. As both a fastener manufacturer and user, we can nearly always find a workable solution to any assembly problem. In some applications, a modification in the design may be the right solution, while in others the only effective solution will prove to be a special fastener . . . one specifically designed to eliminate the trouble. Next time you have an assembly problem, give us a call. We'll do our best to help you solve it.

BETHLEHEM STEEL

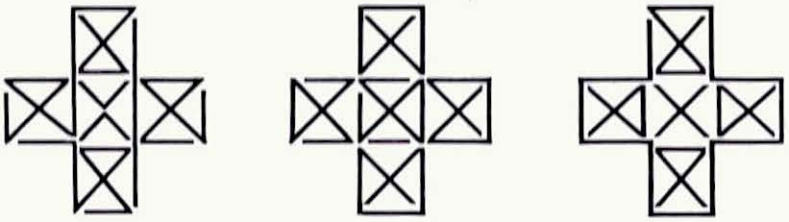
P.S. We've worked out several solutions to the puzzle. To compare them with yours, just turn the page.

Here are our solutions to the bolt puzzle

(See preceding page for puzzle.)

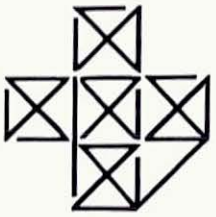
in six moves, it's a cinch.

Here are just a few of the many possible variations.



but five moves or less?

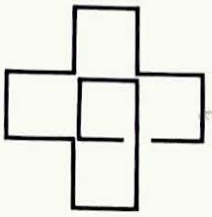
Workable solutions to fastener problems often call for insights that go beyond the obvious. And that's what's called for here. The clue to the solution was set forth in the rules: extensions beyond connecting bolt heads are permitted. Thus, it *is* possible to complete the puzzle in five or less moves by extending one of the lines at any outer bolt head beyond the perimeter of the puzzle's basic structure.



The result is a slight modification of design (often the case in genuine assembly problems) . . . but definitely a workable solution.

would you believe one?

You can't rule out the possibility . . . provided A490 bolts are substituted for A325 bolts. Since the strength of two A490 bolts is roughly equivalent to that of three A325 bolts of similar size, it is theoretically possible to eliminate five bolts and all cross-tracing from the layout. The result is a major change of design while still retaining the basic five-section structure:



Puzzle-solving experts may well scream "foul" at this unconventional approach. But we're in the fasteners business . . . not the puzzle business. To us, and to fastener users everywhere, such a solution is "fair play" all the way. In fact, it's just this kind of unconventional solution that results in both time and money saved in assembly operations.

We've helped others solve bolting problems. How can we help you?

BETHLEHEM STEEL